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SEED MIXTURES FOR BUSH BURNS.

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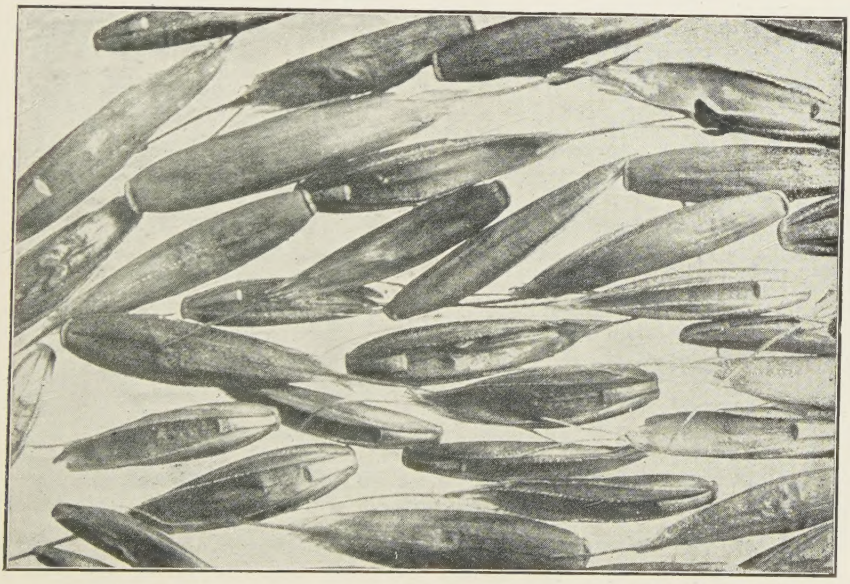
THE majority of the surface-sown grass lands of New Zealand are destined to remain for all time under permanent pasture. In many cases the configuration of the country precludes the plough in bringing our originally forest-clad areas under any system of alternate cropping. Again, in many districts the breaking-up and renewing of surface-sown pastures is not only expensive, but also unsatisfactory, as difficulty is often experienced in securing a good sward. This refers, of course, to land of inferior quality where short-rotation cropping is inadvisable. Temporary cultivation, in fact, often appears to benefit the weeds already in the soil more than it does the valuable pasture elements. In nearly every instance the necessity for renewal of surface-sown grass land is due to the

excessive development of an undesirable vegetation, and the avoidance of such development would eliminate any necessity for renewal. This can best be secured by the use of suitable mixtures in the first instance, followed by proper management in regard to stocking, and with top-dressing in those districts where the use of artificial manures becomes necessary. Even in those cases where the surface-sown land is of high fertility, and is finally to be brought under more intensive cultivation, a long time generally elapses between the period of surface sowing and that when the ground by stumping and logging becomes available for the plough. The duration of such surface-sown pastures is generally from ten to twenty years, and in certain instances they may remain for a longer period before their place is taken by crops of short duration. It is thus evident that permanence is the primal consideration in laying down surface-sown pastures. In fact, the whole object of surface sowing is the production of a pasture that will permanently produce a good yield of herbage suitable for the grazing of live-stock. Unfortunately, a good proportion of our bush-burn pastures on inferior ground yield heavily for the first few years after sowing, and then seriously deteriorate in carrying-capacity. In many cases this is due to the use of too large a proportion of short-lived grasses, whose place is afterwards taken by plants that are suited to the conditions but are not of any value from a pasture point of view.

Temporary and Permanent Grasses.

Grasses and clovers are generally termed either temporary or permanent. Temporary ones are those that occupy the ground for a few seasons, while permanent ones remain in occupation for an indefinite period. The terms are bad, inasmuch as the relative permanence of a pasture plant depends more on the conditions to which it is subjected than on the inherent annual or perennial character of the individual. Thus in many cases strictly annual plants, such as suckling and subterranean clover, may be quite permanent in certain pastures, whereas a typical perennial, such as meadow-foxtail, may be quite temporary. In a closed-pasture association—that is, one where all the ground is fully occupied during the whole season and where germination conditions are not favourable—annual plants cannot remain in permanent occupation of the soil. Closed-pasture associations are, however, rare, except those that are laid down with one perennial species. Where a mixture of annual and perennial plants is used the association always becomes open on the death of the annual species, and on

Perennial Rye-grass (Lolium perenne).



Italian Rye-grass (Lolium italicum).

their ability to seed and germinate will depend whether they will continue to form an integral portion of the pasture. The ability to seed under ordinary grazing-conditions is one of the dominant factors favouring permanence, and for this reason the occasional shutting-up of pastures during the seeding season is often of great value. Unfortunately, the majority of the grasses and clovers that seed freely when grazed on are those that are of inferior feeding-quality, and are more or less rejected by stock. Goose-grass, sweet vernal, hair-grass, and Yorkshire fog are good examples of such grasses. Again, in cattle-pastures many plants are allowed to seed and remain permanent that under sheep-grazing conditions are strictly temporary simply because they are not allowed to flower and seed.

It is thus seen that it is a difficult matter to decide what grasses and clovers will be temporary and what permanent unless the conditions to which they are to be subjected are carefully considered.

The main grasses and clovers that are temporary and require to seed from year to year in order to become permanent are as follow :—

Italian rye-grass.	Red clover.
Perennial rye-grass.	Alsike.
Timothy.	Trefoil.
Prairie-grass.	*Lotus angustissimus.*

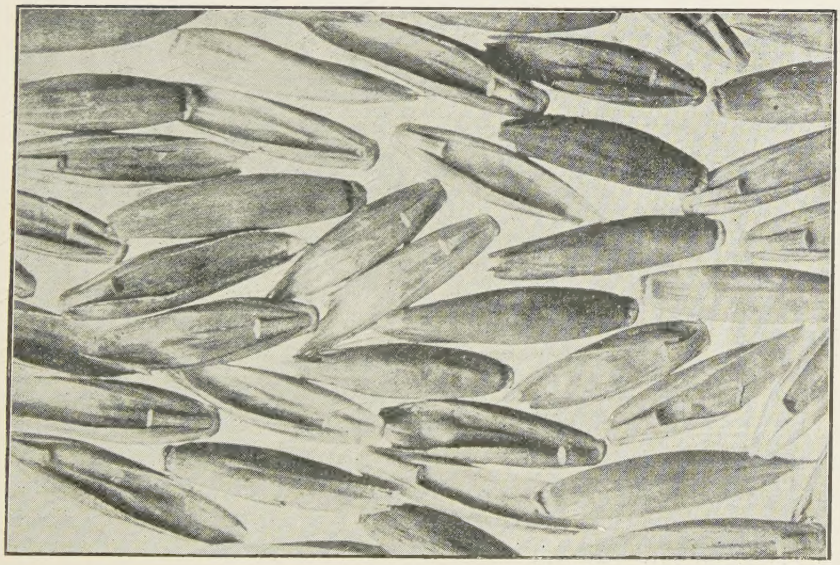
The following are the main permanent or so-called permanent grasses :—

Cocksfoot.	Fiorin.
Crested dogstail.	Red-top.
Meadow-foxtail.	Brown-top.
Meadow-fescue.	*Danthonia pilosa.*
Sheep's fescue.	*Danthonia semiannularis.*
Chewing's fescue.	Paspalum.
Poa pratensis.	White clover.
Poa trivialis.	*Lotus major.*

PURE AND MIXED PASTURES.

There are two main types of permanent pastures, those where one particular species is dominant over all the others, and those where several species together cover the greater portion of the ground. The former are known as pure and the latter as mixed pastures. In Europe it is customary to lay down mixed permanent

Cocksfoot (Dactylis glomerata).



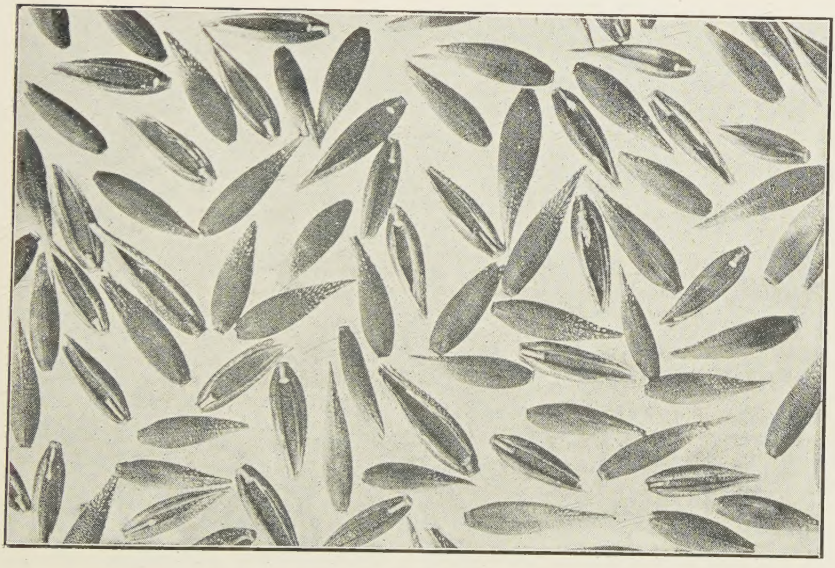
Meadow-fescue (Festuca pratensis).

pasture, which may remain mixed or become pure according to the conditions to which it is subjected. In North America, on the other hand, pure pastures are the rule, the particular grass most suited to the environment being used to the comparative exclusion of all others. The blue-grass and red-top areas are good examples of American pure permanent pastures that are laid down as such. In New Zealand, where the majority of permanent pasture is continuously grazed and where haymaking is such an insignificant feature, it is important that an uninterrupted development of herbage should be produced. Certain grasses and clovers show great variation in their annual period of growth, so that satisfactory continuous grazing can generally be secured only by a judicious mixture of those species that yield their maximum amount of feed at different periods of the year. Again, a variety of herbage is advisable for all grazing-animals, and mixed pastures are preferable in this respect to pure ones. Although, as a general rule in New Zealand, mixed permanent pastures are the type that should be aimed at, in certain cases their successful production is not feasible, owing to special soil and climatic conditions, and a comparatively pure pasture is the only type that will remain permanent. Danthonia country is a good example. In other instances the conditions are so suitable for the development of one special grass of outstanding merit that it would not be advisable to lay down mixed pasture. Thus on country where rye-grass is permanent, even when continuously stocked, pure pastures of this grass are probably better and more profitable than mixed ones.

The Cost of Seeding.

The cost of different mixtures varies very much according to the amount and variety of seed used. Many farmers do not spend more than 7s. or 8s. per acre, while others may spend as much as £1 per acre. In most cases the more permanent grasses are much dearer than the temporary ones, and in consequence the former are often used very sparingly. This is an extremely bad policy to adopt; permanence of production is the *sine qua non* of all bush-burn pastures. Unlike a temporary one, a permanent pasture does not need to have its initial cost recovered, but can be looked upon as a truly permanent improvement, and to be profitable need return only a good percentage annually on the money invested in its formation. When this point is considered the folly of excluding valuable grasses and clovers on account of their cost is apparent. In all cases a good permanent pasture vastly increases the value of bush-burn country, so that the difference

Meadow-foxtail (Alopecurus pratensis).



Crested Dogstail (Cynosurus cristatus).

of at most a few shillings per acre in the seeding, provided it will increase the efficiency and permanence of the pasture, should never be taken into consideration.

Grasses and Clovers used.

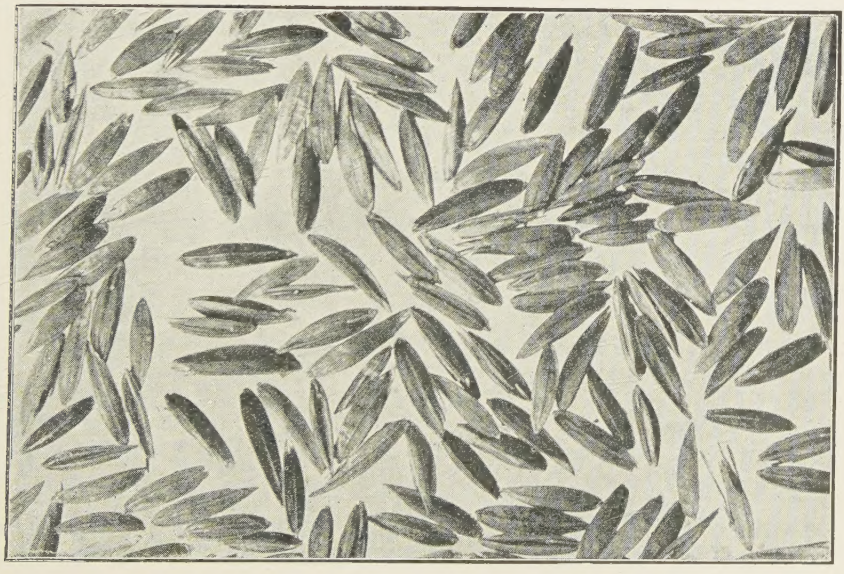
The number of species employed in the formation of bush-burn pastures is often large, and the following is a fairly complete list of those used for this purpose :—

Perennial rye-grass (*Lolium perenne*).
Italian rye-grass (*Lolium italicum*).
Cocksfoot (*Dactylis glomerata*).
Crested dogstail (*Cynosurus cristatus*).
Timothy (*Phleum pratense*).
Meadow-foxtail (*Alopecurus pratensis*).
Meadow-fescue (*Festuca pratensis*).
Sheep's fescue (*Festuca ovina*).
Hard fescue (*Festuca duriuscula*).
Chewing's fescue (*Festuca saburicola*).
Poa pratensis.
Poa trivialis.
Fiorin (*Agrostis stolonifera*).
Red-top (*Agrostis vulgaris*).
Brown-top (*Agrostis canina*).
Danthonia pilosa.
Danthonia semiannularis.
Prairie-grass (*Bromus unioloides*).
Ratstail (*Sporobolus indicus*).
Paspalum (*Paspalum dilatatum*).
Rice-grass (*Microlæna stipoides*).
Red clover (*Trifolium pratense*).
White clover (*Trifolium repens*).
Alsike (*Trifolium hybridum.*)
Trefoil (*Medicago lupulina*).
Lotus major.
Lotus angustissimus.
Lotus hispidus.
Yarrow (*Achillea millefolium*).

Rye-grass (Lolium perenne).

Perennial rye-grass is included in all bush mixtures. In the earlier days of surface sowing rye-grass was always the main seed

Smooth-stalked Meadow-grass (Poa pratensis)



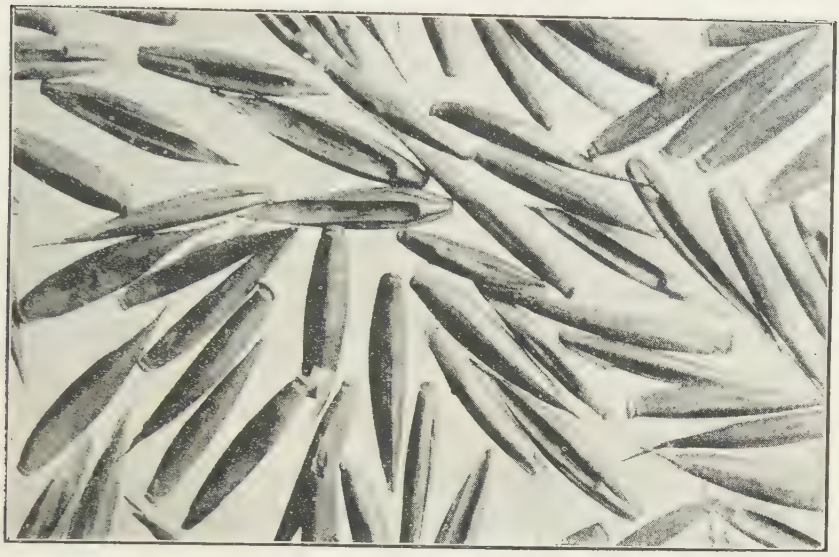
Rough-stalked Meadow-grass (Poa trivialis).

used, and on country where this grass is permanent it should always be the principal constituent of the mixture. On much bush-burn country rye-grass is, however, quite a temporary grass, not lasting more than three or four years. On this type of land the lavish use of rye-grass is inadvisable. Many surface-sown pastures on land unsuited to rye-grass have seriously deteriorated in carrying-capacity after the first few years, through the mixture used being mainly composed of this grass. There is a very prevalent opinion that rye-grass seed harvested in the North Island, especially that from Hawke's Bay and Poverty Bay, is more perennial in character than seed from the South Island. Evidence both for and against this contention is not lacking; but there seems little doubt that seed from old-established pastures is more permanent than that harvested from alternate-cropping land. Nevertheless, it must be clearly understood that on many soils rye-grass, no matter what may be the origin of the seed, will not persist under ordinary gazing-conditions, and under such circumstances its employment to the exclusion of a sufficient quantity of truly permanent grasses is a fatal policy to adopt.

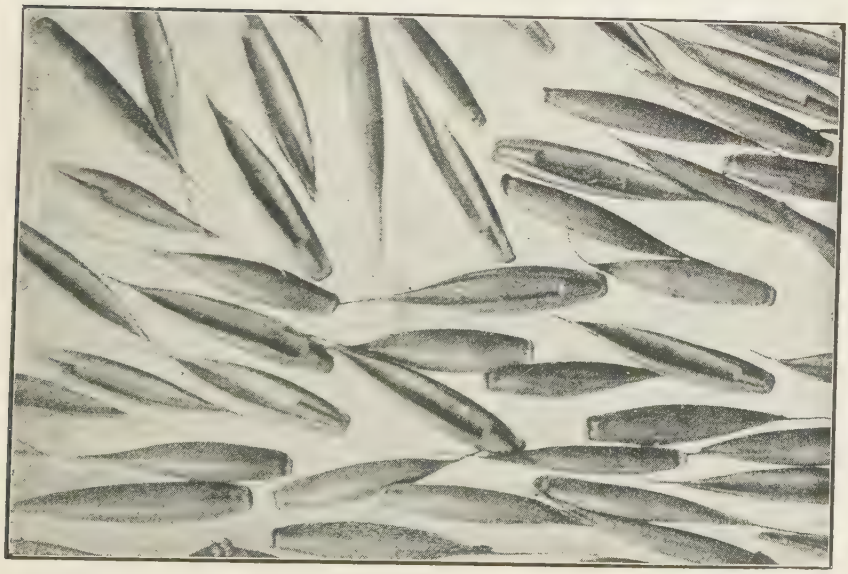
Rye-grass seed is occasionally imported, but this only occurs under very exceptional conditions. New Zealand generally produces more seed than is required for local requirements. About 55,000 acres are annually cut for seed. Of this area, nearly four-fifths is located in the cereal-growing belt of the South Island, and about one-fifth consists of permanent and semi-permanent pasture in the North Island. New Zealand machine-dressed seed, when harvested under favourable conditions, is excellent both as regards purity and germination. In certain seasons there is, however, a great difference in the germination-capacity of different lines. Good average seed should have a purity of not less than 98 per cent. and a germination of not less than 85 per cent., and should weigh over 29 lb. per bushel. The presence of red clover in a sample is generally indicative of seed from young pasture, and such lines should be avoided for surface sowing.

Italian Rye-grass (Lolium italicum).

Italian rye-grass is used in about 75 per cent. of the bush-burn mixtures. It is quite temporary on all land except that of very heavy nature devoted to cattle-feeding. Under such circumstances, if allowed to seed, it may remain a permanent constituent of the pasture. In general, however, its duration on surface-sown land can be put down at two years, after which it is replaced by other plants. Italian rye-grass gives a larger initial



Chewing's Fescue (Festuca saburicola).



Sheep's Fescue (Festuca ovina).

yield than perennial rye-grass, and is the first grass to be fed down. I am inclined to think that it should be included in all mixtures, and should largely replace perennial rye in those sown on land where the latter grass is temporary.

All the seed used is produced locally, the majority being grown in the South Island. The seed is distinguished from perennial rye-grass in having an awn, but this appendage is easily broken off in the cleaning-machines, and then it becomes impossible to distinguish between the two species. Nearly all samples contain a good deal of perennial rye-grass, as the Italian rye-grass crops always contain considerable quantities. The germination should be about 85 per cent., and the purity, apart from the presence of perennial rye, should be 98 per cent. In buying, preference should be given to well-marked (awned) samples.

Cocksfoot (Dactylis glomerata).

Universally used in all surface-sowing mixtures. It is the most valuable pasture-grass in New Zealand, being adapted to a wide range of soil and climatic conditions. When allowed to get away the herbage becomes harsh, but when kept well eaten down it affords a continuous supply of very palatable fodder. It is the dominant grass on many permanent pastures, and, being a fairly deep rooter, is less affected by drought than are many other varieties. All the seed used is grown locally, the majority being produced on Banks Peninsula. The germination is not always satisfactory. All seed used should be carefully tested, and lines giving a growth of less than 60 per cent. should be rejected.

Crested Dogstail (Cynosurus cristatus).

After perennial rye-grass and cocksfoot, this is one of the most generally used grasses on bush burns. It should, however, be included in all surface-sowing mixtures. It is definitely permanent, and, owing to the seed-stalks not being eaten, sows itself freely. Many farmers consider that the yield of herbage is too small to be of any real value, but this objection is counterbalanced by its extremely good fattening-qualities. It combines well with other grasses, and is, in fact, the best of all "bottom" grasses, filling in any bare patches, and helping to thicken up the turf. In New Zealand it comes away very early in the spring, and the harder it is fed down the greater will be the production of herbage.

All the seed now used is grown locally, the Sandon and Gore districts being the two main centres for its production. New

Timothy (Phleum pratense).

Fiorin (Agrostis stolonifera).

Ratstail (Sporobolus indicus).

Zealand seed is of high quality, but does not keep very well, and seed over two seasons old should not be used. A germination of 80 per cent. can be looked upon as satisfactory. Machined seed is nearly always of a good standard of purity, and does not contain the objectionable weeds that are found in European samples.

Timothy (Phleum pratense).

This grass is used in the majority of bush-burn sowings, and is valuable as a temporary grass on fairly rich land that is not too dry. On sheep-country it is rapidly eaten out, but on land devoted to cattle and allowed to seed occasionally it may remain permanent. It comes away fairly rapidly, and generally produces the bulk of its herbage in the second season. Nearly all the seed is imported, the majority coming from the United States of America. Ox-eye daisy and Californian thistle are frequent impurities, so that care has to be exercised in the buying of the seed. The germination of good seed should not be lower than 90 per cent.

Meadow-foxtail (Alopecurus pratensis).

Meadow-foxtail is one of the most valuable of permanent grasses on surface-sown land, to which it is suited. It requires a moist soil, and it should be included in all mixtures where the rainfall is over 50 in. per annum. It grows especially well on papa country, and gives a large yield of nutritious herbage from the early spring right to the winter. When used, about $\frac{1}{2}$ lb. is included in the mixture; but I believe that it would pay to sow in larger quantities, and that where the conditions are favourable to its growth it should be one of the leading grasses used. Its short underground stems enable it to cover the ground well, and, unlike such spreading varieties as fiorin, combines well with other grasses.

A certain amount of seed is raised locally, but the majority is imported from the low countries, especially from Holland, where it is the most esteemed of all permanent grasses. The great objection to meadow-foxtail is its low germination, many lines that are offered being comparatively valueless. One of the main reasons why many farmers do not consider meadow-foxtail to be of much value on bush burns is due to their having used seed that consisted mainly of chaffy seeds. Samples germinating less than 40 per cent. should not be used, or, if they are, the quantity per acre should be increased. Lines often contain a good deal of impurities, Yorkshire fog being only too common. In buying

Small-seeded Danthonia (Danthonia semiannularis).

Large-seeded Danthonia (Danthonia pilosa).

foxtail the bushel weight should always be ascertained, and the purchase of lines of less than 10 lb. weight should not be entertained.

Meadow-fescue (Festuca pratensis).

This is a very valuable grass for surface sowing, but it is, unfortunately, rarely used, owing to the price being generally high. If is often permanent on country where rye-grass will not hold, and should be largely used to replace rye-grass in mixtures for such land. At the present time the price of the seed is comparatively low, and from 2 lb. to 3 lb. should be included in all mixtures, except those for very poor land, where the sowing of such grasses as danthonia and Chewing's fescue are necessary to secure a permanent sward. The seed used is all imported, the majority being of American origin. The germination should not be less than 85 per cent.

Sheep's Fescue (Festuca ovina).

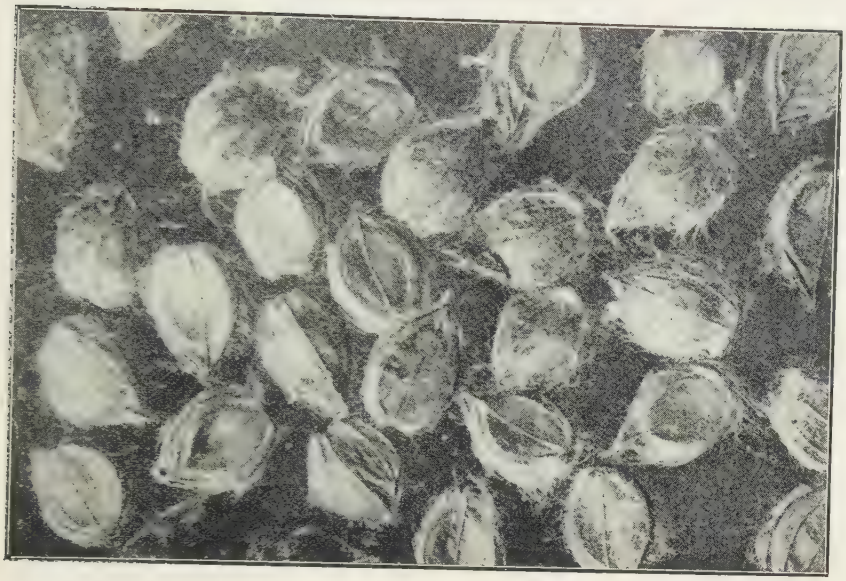
This grass and its near relative, hard fescue (*Festuca duriuscula*), are often included in mixtures, but their use should be restricted to poor soils which are not particularly dry. The yield of herbage is comparatively small and is acceptable to stock only when young. For my part, I am of opinion that the value of sheep's fescue and its allies is greatly exaggerated. On ground inferior enough to warrant the growing of fine-leaved fescues Chewing's fescue is preferable, as it is more permanent. On good land the fine-leaved fescues only occupy ground that could be profitably filled with more palatable and higher-yielding species.

All the seed of sheep's and hard fescue is imported, the majority being of North German origin. The germination is often very low; 60 per cent. can be looked upon as satisfactory.

Chewing's Fescue (Festuca saburicola).

Regularly included in mixtures on poor country. For my part, I do not like this grass, as stock relish only the young growth, and unless kept fed down the herbage becomes very unpalatable. Also, it is very apt to overrun a pasture to the detriment of other grasses. Still, on land that is difficult to grass permanently with the better varieties Chewing's fescue is very useful, but in most cases I am inclined to think *Danthonia pilosa* would be preferable.

All the seed used is locally grown, and is produced mainly in Southland, where about 7,000 acres are annually harvested. The germination is generally far superior to the imported fine-leaved



Paspalum (Paspalum dilatatum).

New Zealand Rice-grass (Microlæna stipoides).

fescues, and for this reason its use has become popular. Tall fescue (*Festuca arundinacea*) is also used occasionally on bush burns, and appears to be quite a satisfactory grass on dry hillsides, where it can be kept down by ordinary grazing.

Smooth-stalked Meadow-grass (Poa pratensis).

Poa pratensis is usually included in mixtures for light land and in dry localities. In such situations the yield is not large, but on better-class land this grass is a decidedly good one. The great objection to its use is the difficulty of eradicating it on cropping-land, but this does not apply to the majority of bush burns. On good land the yield is high. It does not occupy the ground to the exclusion of other grasses, a valuable characteristic when used on poor land. At least ½ lb. per acre should be included in all permanent bush mixtures, and in many cases a heavier sowing would be beneficial. There is no doubt that *Poa pratensis* should occupy a more important position in bush sowings than it does at present.

Nearly all the seed is imported, mainly from the United States. It is often seriously admixed with the comparatively worthless Canadian blue-grass (*Poa compressa*), and no line should be used unless it is over 95 per cent. pure *Poa pratensis*. The germination is nearly always low; samples showing a growth of over 40 per cent. can be looked upon as satisfactory.

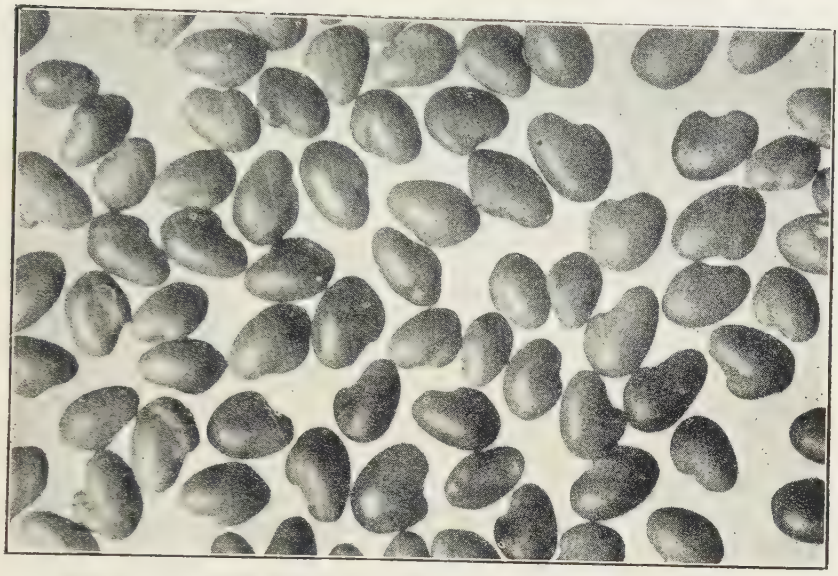
Rough-stalked Meadow-grass (Poa trivialis).

This is a valuable grass both for dry and moist soils, but thrives better on the latter type. It should always be sown in mixtures containing meadow-foxtail, as these two grasses combine well together. Unlike *Poa pratensis*, it has no underground stems, so that individual plants do not form large patches. A quarter of a pound is about the average sowing, but I advise at least 1 lb. in all soils suited to its development.

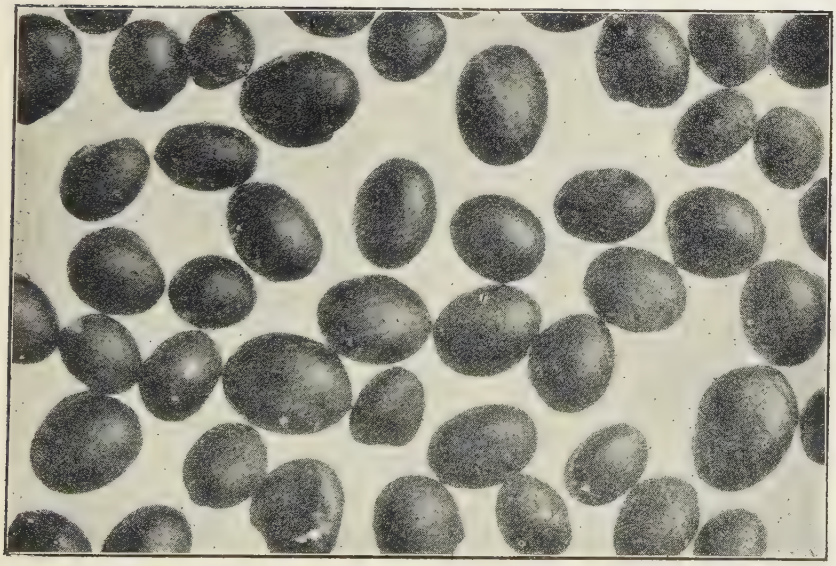
Nearly all the seed used is of European origin, and the germination is always superior to that of *Poa pratensis*.

Fiorin (Agrostis stolonifera).

Under the heading of fiorin can be grouped the two allied grasses, red-top (*Agrostis vulgaris*) and brown-top (*Agrostis canina*). All these varieties are coming into considerable prominence in the grassing of comparatively poor country. They have the disad-



Red Clover (Trifolium pratense).



Subterranean Clover (Trifolium subterraneum).

vantage of combining badly with other grasses and yielding the best of their herbage late in the year. Stock are not particularly fond of them, and they should never be used where either rye-grass or cocksfoot will form a permanent and profitable pasture. There is a great range of variation in these grasses, and samples may at times contain all three species, which to the layman are difficult to distinguish by their seeds. A very good type of red-top, known under the name of "Matakana red-top," is harvested in limited quantities, and the same applies to brown-top. All the fiorin used is imported. The germination is generally good. The various species of agrostis are slow in coming away, and do not tolerate heavy shading with other taller and more rapidly growing grasses.

Danthonia.

The two species *Danthonia pilosa* and *Danthonia semiannularis* are used occasionally in bush-burn mixtures. In general, *Danthonia pilosa* is quite a high-class grass, and its use must extend very rapidly. For country that is liable to revert into fern or scrub the danthonias are particularly valuable. It is frequently stated that the fattening-qualities of these grasses are poor, but it must be remembered that their use is advocated only on land that is not adapted for fattening.

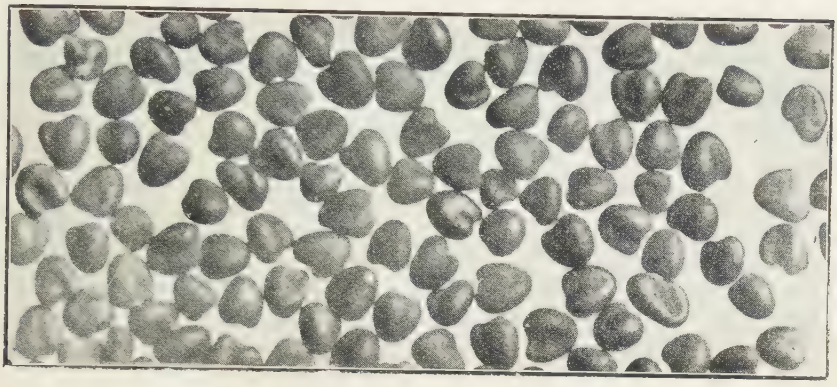
All the seed used is locally produced. Hawke's Bay seed appears to be superior to any other. The seeds of the two species are easy to distinguish, that of *pilosa* being larger and less hairy than that of *semiannularis*. The seed is often harvested rather immature, and the germination suffers in consequence.

Ratstail (Sporobolus indicus).

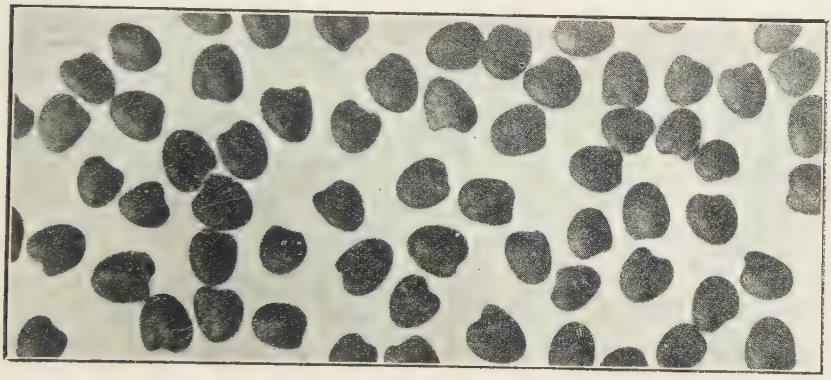
Formerly the grass was extensively used, but during recent years it has been largely replaced by the various species of agrostis and danthonia. The harsh herbage is its chief drawback, but in certain warm localities likely to revert to manuka its use is more than justifiable. All the seed used is locally grown, and is sold in a shelled condition. The average germination is not high, 60 per cent. being good.

New Zealand Rice-grass (Microlæna stipoides).

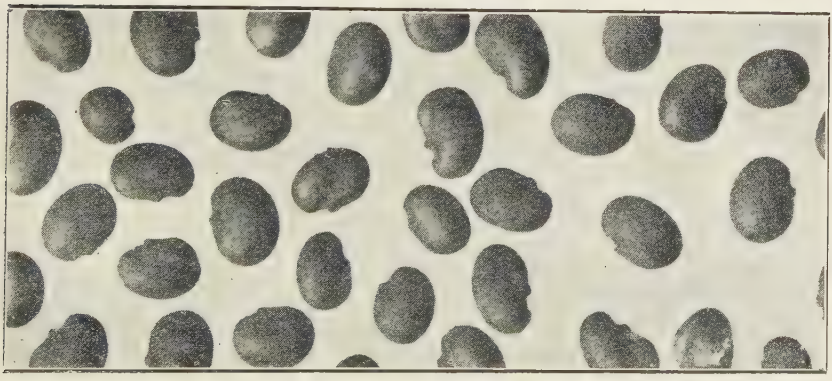
Occasionally used, but the high price has prevented its common adoption on certain types of country. It is a good grass in fern and light-scrub country, and is very permanent. The yield of herbage is inferior to the best forms of *Danthonia pilosa*.



White Clover (Trifolium repens).



Alsike (Trifolium hybridum).



Trefoil (Medicago lupulina).

Paspalum (Paspalum dilatatum).

In the North Auckland province this is one of the most valuable of grasses. Its great drawback is the small amount of herbage produced in the winter, and as it usually forms pure pastures this is a serious objection. Being one of the most deeply rooted of all grasses, it withstands long periods of drought. Paspalum should never be sown on good cocksfoot or rye-grass country.

Nearly all the seed is imported from Australia. The seed ripens very unevenly, therefore unless it is hand-harvested the germination is poor. 35-per-cent. growth can be looked upon as satisfactory for ordinary seed.

Prairie-grass (Bromus unioloides).

Occasionally sown. Its use could be extended with good results on burns where there is an abundance of ashes to cover the seed. It is one of the best of winter-growing grasses, and is nearly as quick in coming away as oats. When heavily stocked it is soon eaten out, but in many bush burns it would be a better temporary grass to use than Italian rye-grass.

The seed is generally of high germination, but, being so much larger than the ordinary grass-seeds, is difficult to handle in a mixture.

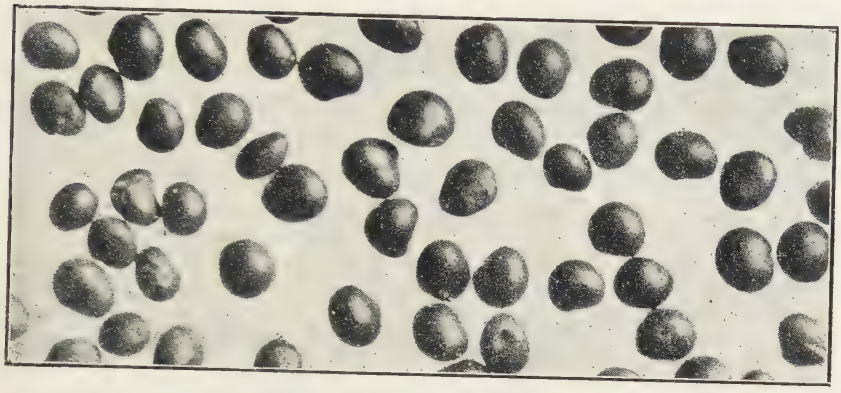
Red Clover (Trifolium pratense).

Under the term "red clover" cow-grass is also included. Red clover is generally included in mixtures on good bush-burn country and yields very heavily for one or two seasons. It is, however, rapidly eaten out in sheep-country, and is never a prominent constituent of old pastures. I should, however, include this clover in all mixtures, but I do not advise sowing more than 1 lb. per acre, except in localities where cattle-grazing is to be the main feature. On cattle-pastures it lasts a considerable period, and a heavier seeding is usually profitable.

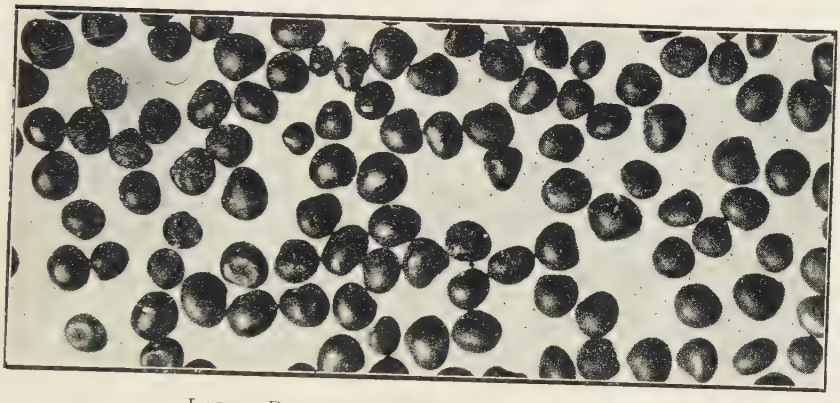
White Clover (Trifolium repens).

Used in nearly all mixtures. At least 1 lb. should be sown per acre. It is the most valuable of all the clovers for permanent pasture, but on dry land the yield is small.

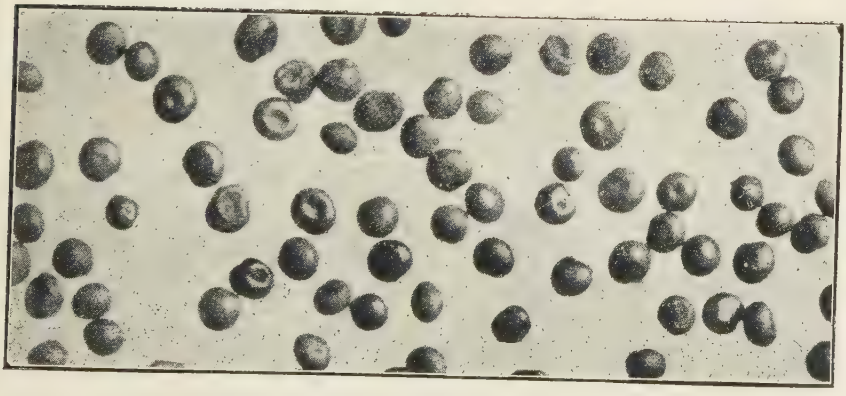
Most of the seed is imported, and no seed is likely to contain more impurities than this clover. The germination is generally good. Low-priced lines should be avoided, as they always contain large quantities of objectionable weed-seeds.



Birdsfoot Trefoil (Lotus corniculatus).



Large Birdsfoot Trefoil (Lotus major).



Lotus angustissimus.

Alsike (Trifolium hybridum).

Used only on better-class bush burns. It is more permanent than red clover, but does not normally last many years.

Nearly all the seed is imported from America, and very frequently contains Californian thistle. For this reason, unless the seed can be guaranteed thistle-free, I should be inclined to omit this clover from bush mixtures.

Trefoil (Medicago lupulina).

An annual clover that often remains permanent on sheep-country, owing to its seeding freely even when heavily stocked. It should be included in all mixtures on sheep-country. The seed is all imported, and is, as a rule, cheaper than any other clover.

Lotus major.

Three species of lotus are regularly used—*Lotus major*, *Lotus angustissimus*, and *Lotus hispidus*. In former years *Lotus corniculatus* was also regularly used on dry land, but *Lotus hispidus* and *Lotus angustissimus* have completely taken its place in present-day mixtures. *Lotus major* is a perennial, and on moist soils is a valuable clover. Stock, however, are not particularly fond of it after it has reached the flowering stage, but when the herbage is young it is greedily eaten. The value of the other species of lotus has not yet been properly demonstrated, although they appear to be becoming very popular. In my opinion, *Lotus corniculatus* is superior to any other on dry soils.

Yarrow (Achillea millefolium).

Although neither a grass nor a clover, yarrow is often included in mixtures on very light country. It is apparently useful on sheep-country, but its use should be restricted to poor soils. Not more than 1 oz. per acre should be employed.

Mixtures used on Bush Burns.

The following table details some fifty-odd mixtures that have been used during the past two years in various parts of New Zealand. The mixtures have been kindly supplied me by various seed-merchants from their order-books, and are typical examples of those being used at the present time. The turnips and allied seeds that are regularly used in bush-burn mixtures are not taken into consideration, as they do not play any part in the final constitution of the pasture.

Name of Seed.	Port Waikato.	East Coast, North Island.	East Coast, North Island.	Taihape.	Te Kuiti.	Awakino.	East Coast, North Island.	Uruti.	Raglan.	Tahora.	East Coast.	Te Kuiti.	Helena Bay.	Whangamomona.	Whangamomona.	Waikato Heads.	Ongarue.	North Auckland.	Whangamomona.
Perennial rye-grass ..	4	8	6	4	6½	5	10	3	6	8	10	7	3	6	10	5	4	2	6
Italian rye-grass ..	1½	..	2	4	2	2	..	..	1	..	5	1	1	3	..	..	1	..	3
Cocksfoot	3	2	3	4	1	6	4	12	7	8	3	6	10	8	5	8	12	5	8
Crested dogstail ..	¼	¼	¾	..	1	½	¼	..	½	¼	..	2	..	½	½	..	½	½	1
Timothy	1	¼	..	..	½	½	..	..	1	¼	..	½	..	..	1	2	1	..	..
Meadow-foxtail ..	⅛	½	..	..	..	..	..	..	½	¼	..	¼	..	..	..	..	..	..	..
Meadow-fescue	⅛	..	..	..	..	..	..	..	½	..	..	½	..	..	..	2	1	..	..
Sheep's fescue	⅛	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Chewing's fescue ..	..	..	..	½	..	..	..	..	..	..	..	..	..	¼	..	1	..	2	½
Poa pratensis	..	½	¼	½	1	½	½	..	½	..	¼	1	..	..	½	..	..	..	..
Poa trivialis	..	..	..	..	½	..	..	..	..	..	..	..	..	½	½	..	..	..	½
Fiorin	..	..	..	..	..	..	..	¼	..	..	..	..	..	..	..	..	..	..	..
Red-top	..	..	..	..	..	¼	..	..	..	..	..	..	..	..	..	¼	..	..	..
Brown-top	..	..	..	..	..	..	..	..	..	..	..	..	½	..	..	¼	..	1	..
Danthonia pilosa ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	2	..
Danthonia semiannularis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Prairie-grass	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Paspalum	..	..	..	..	..	..	..	½	..	..	..	..	1	..	..	..	..	½	..
Red clover*	⅛	..	..	..	..	½	..	⅛	1	½	..	½	2	¼	¾	1	..	1	..
White clover	⅓	1½	1	..	1	½	1½	¼	¼	1	1	½	1	½	½	½	½	2	½
Alsike	⅓	..	..	½	1	..	..	..	¼	..	..	..	½	¼	¼	..	..	1	..
Trefoil	..	..	..	..	½	..	..	½	..	½	..	..	..	¼	¼	..	..	1	½
Lotus major	¼	..	..	..	..	..	..	¼	..	..	..	1/10	½	..	..	..	..	½	..
Lotus angustissimus† ..	⅛	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1½	..
Yarrow	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	‡
Total pounds per acre ..	12 23/24	13	13	13½	15	15¾	16¼	17¼	18½	18¾	19¼	19 1/10	19½	19½	19½	19½	20	20	20

* Includes cow-grass. † Includes *Lotus hispidus*. ‡ Trace.

Name of Seed.	Raurimu.	Whangamomona.	Ongarue.	Ongarue.	Awakino.	Taumarunui.	Hokianga.	Kawhia.	Whangaroa.	Kawhia.	Marlborough Sounds.	Awakino.	Owhango.	Marokopa Heads.	Auckland.	Raethi.	Piopio.	Te Kuiti.	Ongarue.
Perennial rye-grass ..	8	5	5	4	6	7	4	3	4	4	3	6	6	13	7	3	8	6	6
Italian rye-grass ..	2	3	1	..	4	..	2	2	..	2	..	1	2	1	..	3	..	3	2
Cocksfoot	6	6	12	9	8	10	6	11	9	6	12	6	10	6	5	9	9	5	8
Crested dogstail ..	½	½	½	1½	..	1	1½	½	..	1	..	1	½	½	1	1	1	3	½
Timothy	1	2	1	..	½	1	..	½	..	..	..	1	1	..	1	1	1	..	2
Meadow-foxtail ..	½	1	..	..	..	..	..	..	..	..	..	1	½	..	½	1	½	..	2
Meadow-fescue	..	..	1	..	..	..	..	..	..	2	..	1	½	..	1	1	..	..	..
Sheep's fescue	..	..	..	..	..	½	..	..	..	1	..	½	..	..	..	..	..	1¼	..
Chewing's fescue ..	..	..	..	1½	..	..	..	¾	⅛	..	..	..	..	..	2	..	..	1¼	..
Poa pratensis	..	..	..	1	..	..	..	1	½	1½	..	2	½	¼	½	¼	½	1¼	..
Poa trivialis	¼	..	..	..	..	..	..	..	..	¼	..	¼	..	..	..	¼	½	1¼	..
Fiorin	..	..	..	½	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..
Red-top	..	..	..	..	..	..	..	..	..	¼	..	..	..	..	..	..	..	..	..
Brown-top	¼	..	..	½	..	..	..	½	½	..	..	..	..	¼	..	..	..	..	..
Danthonia pilosa ..	..	..	..	1½	..	..	..	1	..	1	4½	..	..	..	..	..	..	..	..
Danthonia semiannularis	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
Prairie-grass	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Paspalum	..	..	..	..	..	..	5	..	4	..	..	..	..	..	½	..	..	..	..
Red clover*	½	2	..	1	1	1	2	..	1	1	..	1	½	1	2	1	1	..	2
White clover	½	1	½	½	½	1	1½	1	½	1	1	1	½	¾	2	1	1	1	¾
Alsike	½	..	..	..	½	..	..	..	1	1	..	1	½	..	1	1	1	1	½
Trefoil	..	..	..	..	½	..	..	¼	..	..	..	..	½	¼	..	1	..	..	..
Lotus major	..	..	..	..	..	..	..	¼	..	¼	..	..	..	¼	..	..	¼	..	¼
Lotus angustissimus† ..	..	..	..	..	..	..	..	..	..	¼	..	..	..	..	..	..	..	..	..
Yarrow	..	..	..	..	..	..	..	trace	..	..	..	trace	..	..	..	..	..	..	..
Total pounds per acre ..	20	20½	21	21	21	21½	22	22	22	22½	22½	22¾	23	23¼	23½	23½	23¾	24	24

*Includes cow-grass. †Includes *Lotus hispidus*.

Name of Seed.	Te Kuiti.	Kawhia.	Te Puke.	Awakino.	Mangaihe.	Mangapehi.	East Coast, North Island.	Mangaihe.	Waitara.	Taihape.	Te Kuiti.	Mokau.	Wanganui.	Wairarapa.	Taihape.	Whanganomona.	Taihape.	Utiku.	Mahoenui.
Perennial rye-grass ..	12	7	9	7	8	5	20	10	12	5	10	9	10	8	8	6	12	20	8
Italian rye-grass ..	..	3	3	3	4	3	..	4	3	5	1	4	..	4	4	4	5	5	8
Cocksfoot	5	6	8	10	8	10	3	8	7	10	12	6	5	6	9	8	6	1	12
Crested dogstail ..	½	1	..	1	1	1	1	1	¼	1	..	1½	1	2	..	1	1½	1	1
Timothy	1½	2	1	..	½	½	..	½	1	1	1	1	2	2	4	3	..	1	1
Meadow-foxtail ..	1	2	..	..	..	..	..	..	..	1	..	¼	2	2	..	1	..	..	..
Meadow-fescue	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	2	..	..	..
Sheep's fescue	..	..	..	1½	..	..	..	..	..	..	..	½	2	..	..	..	1	..	..
Chewing's fescue ..	..	..	..	..	1	½	..	..	..	..	..	½	..	..	..	..	..	..	..
Poa pratensis	1	..	..	1	¼	..	..	¼	..	..	..	½	..	..	..	¼	½	..	..
Poa trivialis	..	..	..	..	..	..	..	¼	¼	..	..	¼	..	..	..	..	..	..	..
Fiorin	..	..	..	..	..	..	..	..	..	..	..	⅓	..	..	..	..	..	..	..
Red-top	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Brown-top	..	..	..	..	1	½	..	..	..	..	..	..	..	..	..	..	..	..	..
Danthonia pilosa ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Danthonia semiannularis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Prairie-grass	..	..	..	..	..	1	..	..	..	..	..	..	..	..	1	..	..	..	..
Paspalum	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Red clover*	2	2	2½	..	1	2	..	1	1½	2	1	¾	1½	2	1	2	1	2	½
White clover	1	2	1½	1	1	1	2	1	½	1	1	¾	1½	1½	1	1	1	..	½
Alsike	½	..	..	1	..	½	..	..	..	1	..	½	1½	1½	1	¼	1	..	..
Trefoil	..	..	..	..	..	½	..	..	1	..	1	..	..	..	..	1	1	..	..
Lotus major	..	..	..	..	..	..	..	..	¼	..	..	..	..	..	¼	..	..	..	..
Lotus angustissimus† ..	..	..	..	..	..	..	..	..	..	..	..	⅓	..	..	..	¼	..	..	..
Yarrow	..	..	..	..	..	..	..	..	..	..	..	trace	..	..	..	..	..	..	..
Total pounds per acre ..	24½	25	25	25½	25½	25½	26	26	26¾	27	27	27¼	28½	29	29¼	30	30	30	31

* Includes cow-grass. † Includes *Lotus hispidus*.

Thin and Thick Sowing.

From the foregoing table it can be seen that there exists a very wide range of variation in the quantities of seed used per acre. Many farmers do not use more than 16 lb. per acre, and declare that their results are superior to those of farmers who have used much larger amounts. It is argued that when a thin sowing is adopted the plants stool out better than when sown comparatively thickly. Of course, the quality of the seed should in all cases regulate the amount of seed to be used, and this factor is not sufficiently taken into consideration. Thus, for example, 1 lb. of a certain line of cocksfoot may contain treble the number of living seeds of that contained in an equal weight of another line. Again, certain seeds are much smaller than others, so that a knowledge of the average number of seeds per pound is necessary before the amounts that should be used can be ascertained.

The following table shows the approximate number of seeds per pound, the average germination, and the number of living seeds per pound in good average lines:—

	Number of Seeds per Pound.	Average Germination per Cent.	Average Number of Living Seeds per Pound.
Rye-grass	240,000	80	192,000
Italian rye-grass	270,000	80	216,000
Cocksfoot	540,000	70	378,000
Crested dogstail	900,000	75	675,000
Timothy	1,100,000	90	990,000
Meadow-foxtail	650,000	55	357,000
Meadow-fescue	220,000	80	176,000
Sheep's fescue	620,000	50	310,000
Chewing's fescue	540,000	75	405,000
Poa pratensis	2,000,000	40	800,000
Poa trivialis	2,400,000	60	1,440,000
Fiorin	3,000,000	70	1,750,000
Red-top..	3,000,000	70	1,750,000
Brown-top	3,000,000	70	1,750,000
Danthonia pilosa	550,000	60	330,000
Danthonia semiannularis ..	950,000	60	570,000
Prairie-grass	40,000	90	36,000
Paspalum	440,000	25	110,000
Red clover	220,000	90	198,000
White clover	650,000	85	552,000
Alsike	600,000	90	540,000
Trefoil	310,000	85	263,000
Lotus major	800,000	70	560,000
Lotus angustissimus ..	900,000	70	630,000

I am inclined to favour thick seeding, and consider that not less than ten million living seeds per acre should be sown. In ordinary mixtures this works out at about 28 lb. of grass and clover seeds per acre. It is essential that the whole of the

ground should become rapidly occupied by the desirable plants. In many cases where a thin sowing is adopted weeds are very apt to gain a strong foothold. Again, with regard to stooling out, the fact that all bush-burn pastures are heavily stocked during the first season would tend to cause the thickening of the sole even when very heavy mixtures were used. Then, on account of the seed being surface-sown a good deal of it never germinates, and allowance for this has to be made. With regard to the comparative merits of thin and thick sowing a correspondent has written me as follows: "Many of our oldest farmers still sow 20 lb. or less to the acre, claiming that the grass will stool out in time. There is ample evidence, however, that those who have not hesitated to spend a few extra shillings an acre on their mixtures, and have sown 30 lb. and upwards, are in nine cases out of ten obtaining much more per acre each year from their properties than the extra amount they spent on sowing in the first instance."

The Use of Turnips.

On all bush burns that are to be stocked shortly after sowing, turnips and allied seeds are included in the mixtures. In general, 1 lb. of soft turnips, ½ lb. of rape, and ½ lb. of mustard are used per acre, but in certain instances a heavier sowing is adopted, while in other cases only one of these plants may be used. This practice of utilizing the first few months in growing a special annual crop is often extremely payable, as the land can often be more heavily stocked within a short period of sowing than it can at any other stage in the life of the pasture, and a good deal of the initial cost of converting forest into grass can thus be rapidly recovered. From the point of view of the pasture this growing of a turnip crop is not particularly advantageous apart from the ability to stock heavily without eating out the young grass. It is frequently claimed that the turnip crop is useful in sheltering the young grass, but this contention is not always correct, especially if the crop is a heavy one. In point of fact, few grasses, even in their early stages, require shade, and when this is supplied in excess a spindling growth of grass is often the result.

All the illustrations in this article are taken direct from the original seeds with a magnification of six diameters. Photographs by E. B. Levy.

THE use of pure seed is always sound economy, but in laying the foundation of permanent pasture the employment of pure and high-grade seed becomes a vital essential.

COCKSFOOT.

SELECTION TO SECURE AN IMPROVED STRAIN.

W. S. Hill, B.Agric.

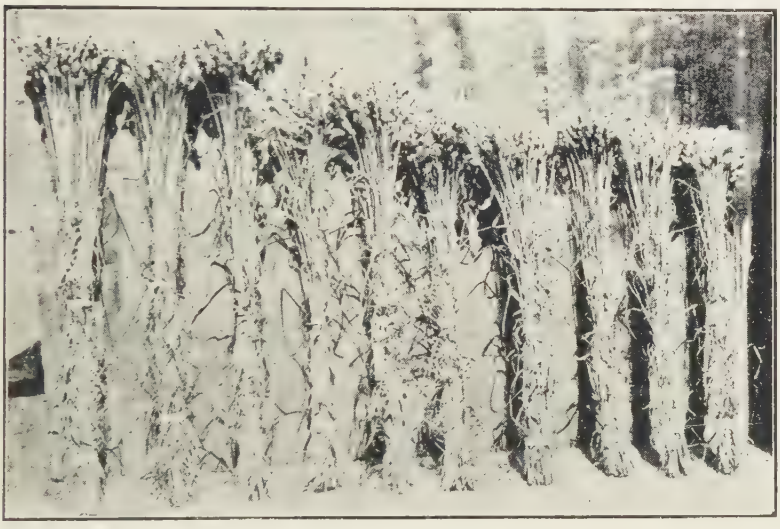
New Zealand owes its natural advantages over most agricultural countries of the world to the fact that its soil and climate combine in providing an exceptional environment for the production of pasture and for the maximum utilization of this by live-stock throughout the year. This being the case, it is obvious that the improvement of the plants of the pasture is a work of vital importance. Perhaps it is only natural to overlook the possibility of the more common things surrounding us, yet what subject for investigation is more important than cocksfoot-grass, one of the most widely distributed and most useful grasses of this country.

Quite apart from the pastoral value of cocksfoot it has to be remembered that a lucrative export trade in New Zealand seed with Great Britain and Europe is already in existence, and that the better the types we can supply the more valuable will this trade become. For many years the production of cocksfoot-seed has been an industry of significance to several districts, Banks Peninsula being a notable instance. Widely distributed as is this grass, it yet remains a vast collection of types and of variations—variations perhaps accentuated by the fact that the seed for half a century has been gathered from an infinite variety of environments: from bush burns, rough hillsides, plantations, roadsides—indeed, from any nook or corner where stock have permitted the maturation of the seed. It may not be out of place to record the results obtained by the Swiss investigator, Dr. F. G. Stebler, who found that New Zealand cocksfoot, although maturing more slowly and later than the French seed, produced a pasture and forage of better quality. From this it will be seen that New Zealand cocksfoot is known and esteemed in Continental countries. Would it not be worth while to widen this reputation by the production of an improved type?

The improvement of cocksfoot by selection offers a promising field. There is undoubted scope with a plant which comes under the eye of practically every one who may be persuaded to assist

the plant-breeder in his search for forms of more economic value. We have good enough example to encourage us in this work. Several of the better-known of the improved varieties of grasses have been secured through the medium of the intelligent layman whose keen observation has enabled him to note a striking individual plant which, fortunately for agriculture, he had the foresight to collect.

In view of the possibilities of an improved strain of cocksfoot an investigation has been instituted at the Moumahaki Experimental Farm to this end. The work is now in its second season. As yet it has largely consisted in choosing desirable parent types



Cocksfoot Sheaves at Moumahaki, demonstrating Wide Variation in Character.
W. S. Hill, photo.]

and selecting and recording definite variations. It has been found that the variations in cocksfoot are very wide, and apply not only to the form of the seed-head or panicle, but to the quantity, quality, shape, and colour of the leafage, to the height, to the degree of rust-resistance, to the earliness of maturity, to the yield of seed, and, in fact, to the general vigour and productivity of the plants. The characters at present sought are bulk and quality of foliage, with a high degree of resistance to rust. Plants exhibiting these desired points to a more or less extent have been isolated; but, owing to the freedom with which cocksfoot cross-pollinates, reliable reproduction by means of seed is rendered very

difficult. In consequence, reproduction of selected types is being effected by several means :—

(1.) Vegetative or clonal reproduction. This consists in subdividing the plant into as many rooted portions as is possible. This provides the best means of accurately studying the particular type and of securing a large plot in order to obtain a fair quantity of inbred seed. By "inbred" is meant seed produced by the pollination of the flowers of a plant with pollen from a flower on the same plant.

(2.) Reproduction by inbred seed. This is accomplished by isolating the best strains in a glazed box. This seed is used for testing the stability of the selection.

C. E. Cuming, photo.]

A Corner of the Cocksfoot-selection Field at Moumahaki.

(3.) Reproduction by open-fertilized seed. This seed is used to ascertain the degree of variation under these conditions. "Open-fertilized" is a term meant to imply that the seed produced may have been fertilized by pollen from flowers of the same plant, or by pollen from other variations or other plants.

The accompanying illustrations will convey some idea of the variations in the experimental plots.

In addition to selecting individual plants another series of experiments has been undertaken. The initial selection has been

based on the germinative energy of the seed. From a bulk sample many seeds which germinated on or before the sixth day were picked out. These were potted, and from them some 340 plants were grown. Subsequently these individuals were reduced to seventy-five, and the plants were then subdivided for comparative observation. Most wide and important variations have been found to exist.

In improving cocksfoot by selection those responsible for the conduct of agricultural classes in both primary and secondary schools have good material for valuable demonstration work. Not only does it offer an excellent means of emphasizing the value of cocksfoot and the importance of plant-selection, but it provides excellent material for studying the laws of reproduction and variation in plant-life. To those wishing to utilize cocksfoot for this purpose a suitable method of procedure would be to divide the experimental plots into two main portions. (*A.*) Vegetative reproduction: Each selected cocksfoot-plant to be subdivided into rooted subdivisions, and these planted in rows 3 ft. apart and from 2 ft. to 3 ft. between each one. (*B.*) Seed-reproduction: Each row of plants to be raised from seed obtained from one of the selections from plot *A*. The rows and plants to be at similar distances apart. These two plots will then exhibit what variations occur by reproduction by means of open-fertilized seed in comparison with the original plant. Should any selection exhibit characteristics regarded as worthy of further investigation a portion of the plant should be forwarded to Moumahaki for trial.

For demonstrating the degree of variation perhaps no other plant is so suitable as cocksfoot. Material for investigation is in abundance almost everywhere. It is hoped that this subject will in time receive some attention in rural courses, and that definite practical results will be the outcome of enthusiastic and well-directed efforts.

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It is a mistake to plant lucerne immediately after pasture; the better plan is to sow it after a rape or other cleaning crop. If the land is at all dirty it is better to delay the sowing, when repeated harrowings will destroy the weeds as these germinate.—*Primrose McConnell.*

Hawke's Bay Rye-grass.—For the first time on record the Hawke's Bay rye-grass seed crop has proved disappointing. Farmers are strongly advised to secure 1913 seed in preference to that harvested this year, the conditions having been very unfavourable for the development of high-grade seed. A high percentage of the Hawke's Bay seed is in consequence very much lighter than is usually the case.—*A. H. Cockayne.*

FORESTRY IN NEW ZEALAND.

OPINIONS AND RECOMMENDATIONS OF THE ROYAL COMMISSION.

The report of the Royal Commission set up by the Government last year to inquire into conditions of forestry in New Zealand contains much information of value to readers of this *Journal*, as well as important recommendations for the control of indigenous forests and the placing of afforestation in this country on a proper basis.

Importance of Indigenous Forests.

One of the first questions dealt with by the Commission was that of existing forest lands which it was considered desirable to retain permanently as forest covering for the purpose of soil-protection, prevention of denudation, conservation of water, &c. After quoting leading authorities on the value of forest covering for the watersheds of rivers, the Commission reports,—

In relation to its area, few countries in the world are more in need of an adequate forest covering on their high lands than is New Zealand. The lofty mountain-ranges which traverse both Islands and the excessively broken nature of the land in many places, together with an average high rainfall, lead to the presence of innumerable streams, and offer ideal conditions for denudation. In other words, the mountains and hills of New Zealand would, if not forest-clad, be a constant source of danger to the farm lands, on which the prosperity of the Dominion so greatly depends.

From the above it follows that, in order to be efficacious, the climatic reserves of New Zealand must occupy a wide area. Originally, except where conditions of soil or climate were antagonistic, a tree covering occupied the whole land, and extended to a height of between 3,000 ft. and 4,500 ft., more or less, according to latitude. This extensive forest has now been enormously reduced—and, indeed, rightly—in order to meet the wants of settlement; nevertheless, there has been much unnecessary destruction, which has extended to the steep slopes of hill and mountain and even to the upper altitudinal limits of the forest. Thus the headwaters of many streams are no longer surrounded by forest, and the general watersheds of the larger rivers are by no means so efficiently protected as was originally the case. The time has come, in our opinion, when these mountain-forests, which in nearly every instance occupy comparatively worthless ground and contain little, if any, milling-timber, should be zealously protected, nor, except under the most pressing of circumstances, should they be interfered with. Various Commissioners of Crown Lands, as seen in the evidence, are strongly and wisely in favour of materially extending the climatic reserves of their districts.

Reserves.

Several climatic reserves are suggested, both in the North and South Islands. Reference is made to the injury done to forests, especially to the undergrowth, by deer, as well as to orchards and

other crops; and a recommendation is made that "measures be taken to restrict deer to limited areas, sufficient for sport, which may be proclaimed deer-parks, where they can do the smallest possible damage."

The subject of scenic reserves is dealt with at some length. One recommendation in regard to the greater need of measures being taken for the preservation of the reserves was that "notices *re* the reserves be placed not only in conspicuous places in the reserves themselves, but also in public places in the neighbourhood, such as post-offices, railway-stations, &c." In the concluding section the following statement appears: "It may be stated as a broad principle that no forest land, except it be required for the special purposes of a climatic or a scenic reserve, and which is suitable for farm land, should be permitted to remain under forest if it can be occupied and resided upon in reasonably limited areas."

MANAGEMENT OF INDIGENOUS FORESTS.

Under this heading the Commission reports,—

Classification.

Up to the present there has been no economic classification of the New Zealand forest, although such would simplify matters when dealing with specific areas. We therefore suggest that the following classification or one on similar lines be adopted: (1.) Forest containing valuable milling-timber in a suitable position for profitable conversion and situated on land suitable for settlement. (2.) Forest containing valuable milling-timber which cannot be converted at a profit as yet, but growing on land suitable for settlement. (3.) Forest containing valuable milling-timber growing on land unsuitable for settlement. (4.) Forest containing insufficient or unsuitable milling-timber growing on land suitable for settlement. (5.) Forest containing insufficient or unsuitable timber growing on land unsuitable for settlement.

With regard to the above classification, in considering the value of timber and settlement respectively it is probable that certain factors in the future may lead to various modifications. Thus there may be a use for some timbers which are not, or are but little, converted at present—*e.g.*, tawa, taraire, and the various species of the New Zealand beech; various preservative treatments of timbers may come into use; certain species of trees may be found suitable for wood-pulp, or the making of wood-spirit, acetic acid, &c.

Administration.

With regard to the administration of the milling forest, the time has arrived when the remaining millable forest in the Dominion should be administered on one system, under the jurisdiction of the Land Boards, and the method that we would recommend is the one adopted in the Auckland Land District, where the trees are measured and the superficial contents computed before the timber is offered for sale either by auction or tender. By this system the sawmiller knows exactly what he is paying for, and he is induced to cut the bush out cleanly. The State also receives the best price for the timber. At present in some districts the timber is sold on a royalty basis on the output of the mill, in others the timber is sold on a rough estimate of the amount growing on a given block. This estimate, in some cases, is made by the surveyor who is employed and paid by the sawmiller. For obvious reasons this procedure appears to us to be a very objectionable practice. In other districts the jurisdiction is vested in the Warden, and the leasing of timber blocks treated as a mining privilege, although the royalties derived therefrom are territorial revenue.

It appears to us that what may have been good policy in days gone by, when gold-mining was the predominant industry and timber of little value, can hardly be considered adapted to present circumstances when the rapid depletion of our forests is taken into account.

We would most strongly endorse the recommendation of the Royal Commission on the Timber and Timber-building Industries of 1909, that the dual control of the timber by the Warden should be terminated and the sole jurisdiction vested in the Land Boards. . . .

Among the advantages of having the jurisdiction under the Commissioners of Crown Lands and Land Boards the following may be noted: (1.) The Commissioner has the necessary staff to supervise the economical and efficient cutting of the bush. (2.) He can enforce conditions that the timber should be cut within a reasonable time and the way be prepared for settlement before the second growth and noxious weeds take possession of the ground.

We are of opinion that Regulation 105 of the regulations under the Mining Act, 1908, should be revoked, with the possible exception of the clause relating to the use of firewood for domestic purposes, and even this should only be allowed to be taken in places to be prescribed by the Commissioner. Immense damage has been done in the past to the Crown forest by the indiscriminate cutting of timber by the miners, and we fail to see any reason why this one industry should be subsidized at the expense of the State more than any other.

In regard to the payment of halves of timber royalties to local bodies, while we hold that the principle is sound in cases where the roads are used by the millers in carting their timber, still in some districts not 20 per cent. of the timber ever goes on the roads at all. The sawmillers make their own tramways to the railways, and thence it is sent direct to the ship's side. In these cases we consider an amendment of the law is required, and that the half-royalties should only be paid on timber which is conveyed by road. As the law at present stands some districts get large subsidies without any corresponding liabilities, and other districts get nothing.

As we are recommending further extensive planting, we consider that the revenue derived from the timber industry might with benefit be applied to the purpose of providing the necessary funds.

Afforestation.

In treating of the probable future demand for timber in New Zealand the Commission points out the great difficulty of the problem in view of the absence of reliable statistics. The three questions to be considered in dealing with the question, says the Commission, are—(1) What will be the increase in population of New Zealand at the end of certain definite periods? (2) to what extent will the demand for timber increase or decrease in each timber-using trade and industry, including the demand for box timber? and (3) what will be the influence of substitutes for timber on the future demand?

The report proceeds,—

We estimate the amount of timber consumed yearly in New Zealand at the present time as being 358,000,000 ft. As seen from what has gone before, there is no reason to assume that the amount consumed per head of the population will decrease. On the contrary, notwithstanding substitutes for timber, the *per capita* consumption in certain countries appears to be on the increase. Assuming that the population of New Zealand will be doubled in thirty-five years, then, taking the present demand for timber as a basis and multiplying by two, the probable future demand at that time will be 716,000,000 ft. This, as we have already pointed out, is little more than a guess, but it can quite well serve its purpose here, since when the more accurate statistics are available that we recommend to be procured another much more reliable estimate can be made. Before

leaving the subject under consideration we beg to suggest, in view of the great importance of possessing a more reliable estimate than we have given, that the Government cause exact statistics to be procured regarding the output of the sawmills of the Dominion, and also of that of the travelling sawmills, which even now convert a considerable amount of timber grown on private lands. Details should also be given as to the amount of each class of timber, together with exact quantity used in each trade and industry. Even then, with such statistics as the above available, after deducting the timber exported, the total would not be sufficient, since no account would be taken of the wood from private plantations, &c., used as fuel, fencing-posts, and other purposes.

Unsuitability of Indigenous Trees for Afforestation.

The Commission is quite definite in its statement that the indigenous trees of New Zealand are unsuitable for afforestation purposes. The comparatively slow growth of the trees, together with other reasons which need not be detailed, places the forests of New Zealand in a different category altogether from those of Europe and America, since it is quite out of the question to practise any method of afforestation that depends upon their rapid regeneration. The Commission makes the following recommendations in regard to the trees to be planted in the State nurseries:—

Trees recommended.

We specially recommend the following trees for extensive planting in the State plantations: Monterey pine (*Pinus radiata**), Corsican pine (*P. Laricio*), heavy pine (*P. ponderosa*), Oregon pine (*Pseudotsuga Douglassi*), various varieties of poplar, and such Australian gums as have been proved to be the best suited to the localities to be planted. Ash (*Fraxinus excelsior*) should be grown where suitable, but it is not a tree for general planting.

With regard to the poplars, these are to serve the double purpose of acting as fire-breaks and producing timber. As for the gums suitable, there are many trees thriving in various localities in New Zealand which are obviously suited to the local conditions, and from which seed can be readily procured. Seed collected in Australia is to be distrusted for the reasons given when dealing with the procuring of seeds in general. Besides the above-mentioned pines, it is desirable to grow some that would produce fine-grained timber suitable for the finest class of work. For this purpose the Weymouth pine (*Pinus strobus*) is to be highly recommended, since it is recognized as the most valuable pine of the eastern United States. Trial plantings of this tree are doing well at Rotorua, and should they continue to give promising indications as to the suitability of the tree, we consider that it should be planted in increasing numbers. We also recommend that a trial be made of *Pinus excelsa*, which is considered to yield the most valuable timber of any of the Himalayan pines. Seed of this tree can be procured at Queenstown, Homebush (Canterbury), and Greendale (Canterbury).

As it is probable that sand-dune planting will be a feature of the future, we suggest that, in addition to the all-important *Pinus radiata*, the Austrian pine (*P. austriaca*) and the Australian blackwood (*Acacia melanoxylon*) should be made use of.

Relation of State Nurseries to Probable Demand.

Under this heading the following interesting figures are provided:—

On the 31st March, 1912, the State plantations were 18,870 acres in extent. Taking the yields per acre as given by Maw, since we have as yet no reliable New Zealand data, it appears that the final crop of the following timbers is, in Europe: Silver-fir (*Abies pectinata*), 72,600 superficial feet; Scotch pine (*Pinus sylvestris*), 41,400 superficial feet; Weymouth pine (*Pinus strobus*), 51,340 superficial feet;

* Commonly called *Pinus insignis*.—Ed.

and larch (*Larix europæa*), 38,400 superficial feet. Since no estimate is made of thinnings in the above figures, and taking into account the greater size that the trees are expected to reach under New Zealand conditions, we have decided on 50,000 superficial feet as the estimated average yield per acre of the State plantations when converted. The total yield, then, of the 18,870 acres would be 943,500,000 ft., which at the present rate of consumption would last 2·6 years. At the present rate of planting—namely, 2,566 acres in 1911–12—the total yield, when converted, would be 128,300,000 ft., which at the present rate of consumption would last about four months. The determination of the amount to plant yearly in the future will be the duty of the proposed Advisory Forestry Board, who will have more accurate statistics on which to base their calculations. All we can say is that, taking into consideration the expected increase in the crop as more timbers of a high yield are planted, at least two and a half times the acreage of 1911–12 should be planted.

Extension of State Operations and Proposed Locations for New Nurseries.

The treatment of this subject covers such an important field and includes such valuable information that it is quoted in full, with the exception of some final remarks on the conduct of State nurseries, &c.

This question at once leads to the crucial point of the whole afforestation question—namely, the cost of production of the timber crop and the profit or loss thereon. In considering the financial aspect of afforestation it is essential that a strictly commercial basis should be adopted, in order to see whether any proposed plantation will result in a profit or loss to the State. In the first place, as the average cost of recent loans raised by the Government has come to about 4½ per cent., and as we have no means of knowing whether the rate will come down in the future, we have decided to adopt a 4½-per-cent. basis for our calculations.

Notwithstanding that all the leading authorities on forestry, such as Professors Schlich, Sommerville, and Maw, insist on the fact that compound interest on the initial cost of a plantation, and the annual rental value of ground used, should be charged till the timber is in a marketable condition, there still appears to be a good deal of misapprehension in the popular mind on the subject, some persons questioning the necessity of charging compound interest, or, in fact, any interest at all. Then, again, they argue that if the land upon which the plantations are situated belongs to the Government no rental value should be allowed for. Perhaps, to make the position clear, it may be well to work out a supposititious case, thus: Suppose the Government had £100,000 either to lay out in establishing a plantation or to advance on loans at 4½ per cent.: if they adopted the latter course, and compounded the interest for forty years, they would at the end of that time have the sum of £581,636, and if the loan was for eighty years the sum would amount to £3,383,010. without any danger from fires or other risks incidental to forests. So it is clear that if money was put into a plantation it should produce timber at least equal in value to the above amounts at the end of the respective periods, or the operations would entail a loss to the State.

Again, in regard to the rental value of the land: suppose the Government owned 10,000 acres of land worth £10 per acre, and had to decide whether to lay it out in plantations or to lease it for settlement purposes. If the latter course should be adopted, and the rental compounded as above for periods of forty and eighty years, the amounts would be £481,636 and £3,283,010 respectively; so that here again, unless the timber produced at the end of these periods equalled in value the amount shown in the first computation, plus the amount in this, the State would be a loser, irrespective of the indirect revenue from the tenants.

There is, moreover, another fact to be taken into account in estimating the final cost of the timber produced—namely, the annual upkeep or maintenance charges. On the data available this factor is very difficult to estimate. In the report of the Royal Commission on Coast Erosion and Afforestation in the United Kingdom, 1909, the sum of 4s. per acre per annum is set down for the purpose. We are of opinion, however, that owing to the extra cost of labour, and the difficulties in connection with the fire risks, and the eradication of bracken fern, the

above figures would be much too low for this Dominion, and that at least 6s. should be allotted for the purpose stated.

Coming to the cost of the forestry operations already carried out by the Government, the departmental report on State afforestation for the year 1911–12, the latest available, gives the actual cost to date of State nurseries and plantations as £218,433 14s. 2d., to which must be added £30,698 16s. 4d., the value of labour performed by prisoners but not charged for by the Justice Department. No interest on the capital expended nor rental value of the land occupied has been allowed for, but probably if the present value of stock in hand, buildings, implements, and permanent improvements are taken into account they would balance the two latter items. The return shows 18,870 acres as having been planted, and dividing that into the sum arrived at as above gives the cost of each acre now under trees and its upkeep to date as £13 4s.

It is recognized, however, that a great deal of the earlier work done in the plantations was more or less of an experimental nature, and we are of opinion that the present cost of planting an acre, as estimated by Mr. R. G. Robinson—namely, £7 16s. 6d.—should be close to the mark, and we therefore take the round figure of £8 in basing our estimates. This compares favourably with the amount—£6 10s. per acre—given in the report of the Royal Commission on Afforestation in the United Kingdom, when the extra cost of labour is taken into account.

To show what financial result may be expected from the planting of trees that come to early maturity and produce large amounts of timber, such as *Pinus radiata*, poplar, and certain of the *Eucalypti*, in conjunction with land of low rental value, the following example is appended. From the evidence before us, we consider that at a moderate estimate an acre of *Pinus radiata* would produce 150,000 superficial feet of timber at the age of thirty-five years. Taking the value of the land at £2 per acre the figures would work out as follows :—

Expenditure.

	£
10,000 acres planted at £8 per acre at 4½ per cent. compound interest for thirty-five years	373,360
Rental value of land at £2 per acre at 4½ per cent. compound interest for thirty-five years	73,346
Annual maintenance charge of 6s. per acre at 4½ per cent. compound interest for thirty-five years	244,488
	£691,194 (approximate).

Estimated Receipts.

	£
10,000 acres, yielding 150,000 ft. per acre, at 2s. per hundred	1,500,000
Deduct expenditure	691,194
	£908,806

If these results should be attained it would mean a profit above all expenses of nearly £91 per acre, and would allow the timber, after expenses of milling and freightage charges are met, to be retailed to the consumer at from 10s. to 11s. per hundred superficial feet.

In contrast to this, take an example of what would be the result in growing trees that take eighty years to mature, and cannot be expected to produce more than 70,000 superficial feet to the acre, in conjunction with land worth £10 per acre :—

	£
10,000 acres planted at £8 per acre at 4½ per cent. compound interest for eighty years	2,706,400
Annual rental value of 10,000 acres worth £10 per acre at 4½ per cent. compound interest for eighty years ..	3,283,010
Annual maintenance charged at 6s. per acre at 4½ per cent. compound interest for eighty years	2,186,671
	£8,178,081 (approximate).

That is to say, each acre would require to produce nearly £818 worth of timber to square accounts; or, in other words, the standing timbers would have to be sold

at about £1 3s. per hundred superficial feet, which is, of course, an impossible proposition. In the last example, even if the land was only worth £2 per acre, £555 worth of timber per acre would require to be produced to balance the expenditure. This latter case shows the utter absurdity of suggesting such a tree as the totara for afforestation purposes.

In these calculations no account is taken of the value of thinnings, as it is considered that for many years to come the cost of cutting would fully balance any receipts.

We are fully persuaded, however, that given cheap land, economical management, and the right kind of trees to plant, afforestation can be made a highly profitable investment for the State, apart from the secondary benefits of having a good supply of timber to meet the public demand and a possible amelioration of climatic conditions. We would recommend that in future, to keep the forestry operations on a sound commercial basis: (1.) That the Prisons Department should have a credit note for the value of all work done by prison labour. (2.) That 4½ per cent. interest should be debited annually to the cost of the previous year's operations. (3.) That the rental value of the land as assessed by the Government Valuation Department, also on a 4½-per-cent. basis, should be debited to the Forestry Account.

In considering the expansion of the afforestation operations of the State the length of time that the present timber-supply from the indigenous forests will last must be considered. According to evidence before us, the estimate of 33,060,883,437 superficial feet available in the indigenous forests in 1909 is at best a guess, and no one can truly say whether the amount be too much or too little. Our opinion is that it is not safe to conclude that there will be any supply of moment at the expiration of thirty years from the present time, and that unless more stringent methods are adopted to conserve the supply as far as possible the period of supply may be even shortened. From the above it is clear that sufficient provision must be made for the future if we are not to run the risk of a considerable deficiency in our supply of timber. The countries of the Old World are a striking object-lesson to us in regard to afforestation operations. It may be stated briefly that afforestation has been practised to a considerable extent in all civilized countries, and that where economy of method is closely followed it has proved a financial success. The thickly peopled countries of Europe do not begrudge the necessary areas for the work. Even in densely populated Belgium the forest area is 17·7 per cent. of the total area, or 0·2 acre per inhabitant. In Germany the area under forest is 34,989,675 acres. This forms 25·89 per cent. of the total land area and 0·62 acres *per capita*.

Throughout the world timber is becoming both scarcer and more valuable. Quoting from the second Report on Afforestation of the British Royal Commission on Coast Erosion and Afforestation, p. 9, it is stated that Professor Schlich is of opinion that "Since the year 1894 a steady slow rise has taken place, which I estimate at something like 20 per cent." It is further stated in the same report, p. 11, that "Not only do the supplies of timber threaten to prove insufficient to meet the present demand, but it would also appear that the consumption per head of population in this and other countries shows a marked tendency to increase." And again: "Substitutes for timber—steel, concrete, patent compositions, &c.—there are in plenty, but in spite of these timber seems to be more a necessity of modern domestic and industrial conditions."

It may be urged that there is no reason for New Zealand to go in for a comprehensive system of tree-planting by the State since a supply can always be procured from abroad. But the above quotations show that there is but little reliance to be placed upon foreign supplies. Likewise the time may come when it is possible that many countries will forbid the export of their home-grown timber, and there is always the chance of the timber-supply being cut off in time of war. In short, if there is good reason for the countries of the Old World to plant commercial forests, there is far more need for an isolated land such as New Zealand to do so.

Certain parts of New Zealand are treeless, or nearly so, especially Central Otago and the Mackenzie plains. It would be of the greatest advantage to the State if such were afforested. The former district, owing to constant burning of the tussock and overstocking, including the ravages of rabbits, is virtually a desert below a certain altitude. Tree-planting here would be of the greatest benefit, and, even if carried on at a slight loss, the benefits would be great enough to sanction its adoption.

Future Policy recommended.

The Commission makes the following recommendations in regard to the conduct of State nurseries :—

With regard to the future, we consider that certain changes should be made. Two methods are available—namely, either the creation of a special Forestry Department, or the forestry to be, as at present, a branch of the Lands Department. There are valid arguments in favour of both propositions, but after careful consideration we consider that forestry matters should continue to be dealt with under a special branch of the Lands Department, because the branch as proposed below would deal not only with the plantations but with the indigenous forests. As the Lands Department already possesses in the Commissioners of Crown Lands and Crown Lands Rangers the necessary machinery, and men more or less skilled in the work, a great saving would be effected in comparison with setting up another Department with men new to many branches of the work and with a new and complicated machinery. Further, as the land on which the forestry operations would take place would be under the administration of the Lands Department, friction might arise between the two Departments. Nor do we think the magnitude of the operations as yet demands a new Department, but that such is rather a thing of the future.

We consider that the Under-Secretary for Lands has so many other duties to perform that it is quite impossible that he can afford the time necessary for proper supervision of the branch, or for the special studies that the control of a subject so technical as forestry entails. We therefore recommend—

1. That the directing control of the Forestry Branch of the Lands Department should be placed in the hands of an executive officer at an adequate salary, such officer to be of approved administrative and financial ability.

2. That the said officer should have associated with him an Advisory Board of experts in forestry and matters appertaining thereto.

3. That such Board shall consist of not less than four members, who are to be paid such fee as may be prescribed, and to be appointed by His Excellency the Governor.

4. That the Board shall be called together not less than once a quarter for the consideration of matters of policy and important details with regard to the State forestry operations. We also are of opinion that the present Superintending Nurserymen should, under the direction of the proposed Forestry Board, control the operations in the North and South Islands respectively, and that they shall receive remuneration adequate to the important duties they discharge.

Such a Board as composed above would be in a position to confer with the Superintending Nurseryman on many matters of importance. They would also be responsible for changes in method, &c. Forestry is not a science in itself, but is a compound of many sciences together, with a practical knowledge of nursery-work and tree-planting. It seems to us that a combination of men expert in various branches of the subject, and each man with a grasp of the whole, would be far better equipped to direct the forestry operations of the country than would a young man brought out from Europe or America, who, however well he was acquainted with the forestry practice of his own country and with theoretical forestry, would be altogether ignorant of both New Zealand conditions for tree-planting and of the indigenous forests.

Education of Cadets and Others.

We do not propose to put forth any elaborate and expensive scheme with regard to educating the younger members of the forestry service. It is undoubtedly essential that every member of the service should have a fair knowledge of those sciences on which the practice of forestry depends. Already, in the Report of State Afforestation in New Zealand for 1910–11, it has been suggested that as the scope of operation widens it will be necessary to give to a few able and intelligent young men a practical training in the nurseries, combined with a scientific education at one or other of the New Zealand University Colleges. A man who seeks a foremost position as a forester must have, amongst other things, a fair knowledge of botany, entomology, chemistry, geology, surveying, and mathematics. Instruc-

tion in all these can be supplied by the New Zealand University. It seems feasible that young men engaged in the active work of the Forestry Branch of the Lands Department could be transferred for a time to Wellington, where, in the Head Office, they could be engaged in clerical work for their branch, and at the same time attend lectures and learn practical science in the laboratories of Victoria College. The Government Biologist and others could also be made use of to instruct such men. This is quite a humble scheme, but it might well be the forerunner of a thorough education in forestry. As the forestry-work is bound to increase there will be openings for highly trained men. At present talented students from time to time go, by aid of scholarships, to Europe for purposes of study. Such, if they were guaranteed employment for five years in the Forestry Branch at a commencing salary of £200 per annum, might be induced to study forestry in some of the great schools devoted to that subject in England and the Continent of Europe. It is plainly to be seen that such men would be of the greatest value to New Zealand, and it seems to us that our idea is worthy of consideration.

Before leaving this subject of education we must refer with pleasure to the work already being done on their own initiative in the way of educating the young men of the Department by Messrs. Goudie and Robinson. A full account is given of their methods in the Forestry Report for 1910–11.

Legislation required.

We recommend the following:—

1. That the Land Act be so amended as to include climatic reserves in addition to other reserves that can be made under the said Act, and that such reserves cannot be used for any other purposes than those indicated in our report except by Act of Parliament.

2. That a law be enacted making the Warawara Kauri Forest and the 200 acres of the Waipoua Forest, as defined in the body of our report, inalienable national kauri parks.

3. Whereas section 6 of the Scenery Preservation Amendment Act, 1910, absolutely prohibits the use of firearms in a scenic reserve, and as it may be expedient that firearms should be used to exterminate noxious animals that are destroying the vegetation therein, it appears desirable that some amendment of the Act should be made by which the Minister in charge of scenic reserves could grant under proper safeguard a permit for the destruction of such noxious animals.

Assistance in Planting to Local Bodies and Private Individuals.

On this important matter the Commission reports,—

From the earliest days of settlement up to the present time there has been a good deal of private planting, so that plantations, large and small, are more or less in evidence in all the settled districts. No sooner is the indigenous forest felled and burned than the settler forthwith plants a few foreign trees round his homestead.

Tree-planting by the settler is usually undertaken for shelter purposes, with the trees in one or more parallel lines at right angles to the prevailing wind. Sometimes the plantations are a chain or more in width, but, no matter how wide, the trees are nearly always planted so far apart that the lateral branches are not suppressed at an early age, and, in consequence, the timber is of very indifferent quality through its being full of knots. It is this that has led to the timber of certain trees being considered valueless for building purposes—a quite mistaken conception.

Tree-planting by the settler is by no means universal. We were much struck, for instance, by the lack of shelter-belts on the wind-swept Southland Plain, where such would be of inestimable value not only to the farmer but to the whole district.

The reasons for private tree-planting are as follows: (1.) To afford shelter from wind, such shelter being beneficial not only for the stock and the crops, but it also protects the ground from loss of water, and favours the formation of the all-important humus. (2.) For providing firewood. (3.) For supplying fencing-material. (4.) For providing timber for rough buildings. (5.) For furnishing wood for handles, &c., for farm implements. (6.) As box-timber for packing

purposes. (7.) For timber for sale for building purposes if the trees are planted under forest conditions. (8.) For purposes of beauty. (9.) For increasing the selling-value of the land through its making the farm more attractive.

Private planting not only benefits the individual, but, if carried out on right lines, it is of considerable advantage to the State not only in ameliorating the climate and adding to the beauty of the landscape and attractions of the neighbourhood, but in helping to increase the future timber-supply. In this latter regard it is specially important in that these private plantations are much less likely to be damaged by fire than are those of the State; also, as the plantations are in settled districts, the timber is growing just where it is wanted and the cost of carriage is saved.

Long ago the private planter was considered a public benefactor. The Planting Encouragement Act of 1871 provided that any person planting land of 1 acre in extent or over should be entitled to receive in respect of every acre of land so planted 2 acres of rural land of the waste lands of the Crown.

Bearing all the above statements in mind, and believing as we do that the private owner of land who plants trees of a suitable nature thereon under proper forest conditions is benefiting not only himself but the Dominion, we recommend that the State should encourage tree-planting on the following lines: (1.) That the trees for such be supplied at cost price by the State nurseries. (2.) That the planting be under Government advice. (3.) That planting by private individuals should be encouraged by the remission of taxes or otherwise on a certain percentage of the total area of an estate which has been planted to the satisfaction of the proposed Forestry Board.

A considerable amount of planting has already been done by local bodies. As for private planting, so here, too, the trees have almost invariably been planted too far apart. This is in some cases being remedied, and afforestation on more modern lines is now being carried on by the Dunedin City Council and certain of the County Councils. Afforestation by public bodies should certainly be encouraged to the utmost. They, too, should receive trees from the State nurseries at cost price, and any proposed site for planting should be inspected by an official of the Forestry Branch, who should draw up a scheme.

CO-OPERATION IN PLANT-IMPROVEMENT.

A. W. Green.

The plant-selection work at the Ruakura Farm of Instruction has been greatly stimulated by the spontaneous co-operation of many farmers and gardeners who have visited the farm and have become interested in the efforts there being made to secure improved and more vigorous types of plants for the farm and garden. Some of the best types secured have been forwarded by these co-operators in the plant-improvement campaign.

Last year a variety of potato received from Mr. London, and named Maori Chief, exhibited a very decided blight-resistant power. This variety was a sport of the Northern Star. Another good potato was received from Mr. Thomas Elliott, of Gisborne—the Rubicund—a good blight-resister and a heavy-yielding rose-coloured tuber of good culinary quality. Some years ago there was a strain of Rubicund at Ruakura which was discarded owing to its being a very light yielder. Mr. Elliott's strain is vastly superior.

Mr. G. V. Tate, of Waitara, has supplied many seeds of high standard varieties, among them being the Yielder oat, Fison's Blue Stem wheat, and named varieties of onions and lettuce, one of the former—a shallot—being of exceptional quality. A capital strain of Southern Cross potato was supplied by Mr. E. Bond, of Auckland, about four years ago. It has proved the best blight-resister of high table quality grown at Ruakura. Mr. H. Ross, of Hamilton, has forwarded many high-class garden seeds, some of which are the progeny of varieties improved by selection by Mr. Ross. A Wellington gardening enthusiast, Mr. G. H. Davies, has sent seed of a selected variety of silver-beet, which is of a decidedly improved quality on the same-named variety previously grown at Ruakura. Selected artichokes, peas, and beans have also come from Mr. Davies. Mr. Webster, of Rototuna, has supplied varieties of barley, wheat, and oats which are promising very well. The Marquis wheat is probably the best of them. Mr. Webster has also supplied a number of vegetable-seeds. Mr. R. Gunson, of Auckland, forwarded several varieties of Mammoth red clovers. Messrs. A. Yates and Co., the Auckland seed firm, have supplied seeds of clovers, lucernes, and potatoes. Two named *Phormium tenax* varieties possessing very strong fibre have been supplied by Mr. A. Allison, of Wanganui, who has also presented seeds of a number of introduced and native trees. Mr. James Flemming, of Halcombe, has sent three varieties of potatoes, two of which—Queen of the Veldt and Star of Halcombe — are doing well. Seed of a very good variety of garden pea, unnamed, came from Mr. L. Camplin, of Feilding. Selection of this is being continued at Ruakura. A sample of Lodino clover, which is doing particularly well and is showing decided superiority over ordinary white clover, was forwarded by Mr. J. A. Pond, of Auckland. Mr. J. Runciman, of Kihikihi, supplied three samples of clovers, among them being "Runciman's clover," one of the leading clovers in the clover plots at the Exhibition, and one which is also doing very well at Ruakura. Two samples of lucerne came from Mr. R. Dysart, of Blenheim. These are probably strains of Colonial. They are of good quality, showing considerable variation, and have therefore been chosen for selection-work at Ruakura. Mr. W. Lilley, of Kamo, has provided a number of varieties of garden peas.

One of the best ways of increasing knowledge is to compare our own ideas with those of others. The farmer who cannot learn from another can never hope to attain the greatest success.

DAIRYING ABROAD.

DUTCH METHODS OF BREEDING DAIRY STOCK.

Walter Wright.*

The most interesting problem to be studied by the visitor to Holland in search of information in regard to dairying is that of developing the milk-producing power of cattle, which Dutch breeders have pursued with such unique success in the evolution of the black-and-white milking-stock which has made their little country famous in all parts of the civilized world. During my brief visit to Holland I learnt all I possibly could on this subject. The knowledge I gained is better epitomized in the language of Mr. Van den Bosch, formerly Chief Inspector of the Netherland Horned Cattle Herd-book Association, than in any personal account I could give in this connection. Mr. Van den Bosch provides the following instructive report :—

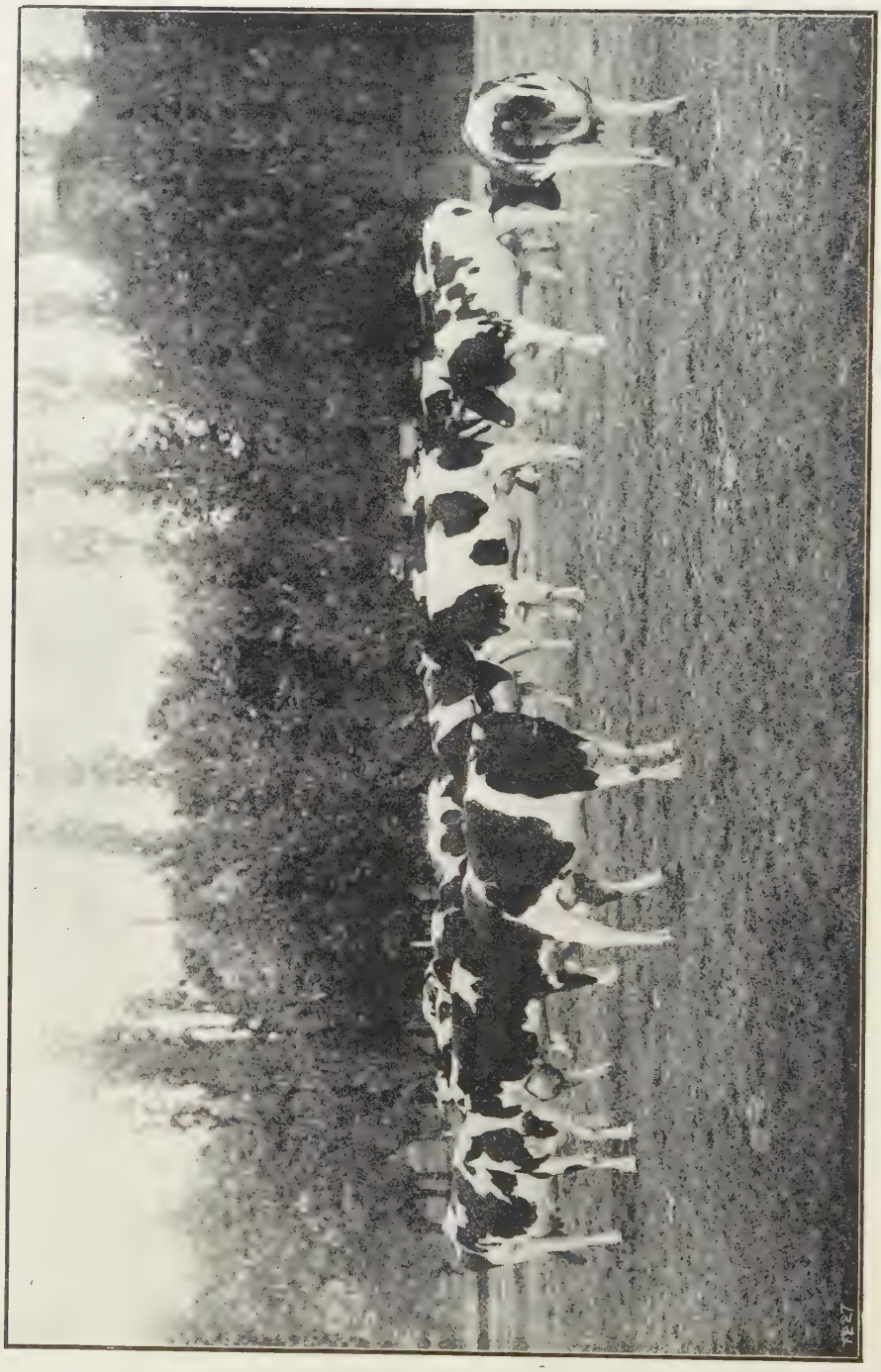
There are at present three species of blood-cattle to be distinguished in the Netherlands. On this classification is based the reorganization of the Netherland Herd-book Association, which aims at the improvement of Dutch cattle-rearing by straight breeding and rational selection. The final classification of these breeds was the result of an investigation, covering the whole country, which, subsidized by Government, was entrusted to Mr. I. G. J. Van den Bosch on the initiative of the Netherland Herd-book Association.

The urgency of the investigation became especially apparent when the attempt at finding a solution of the problem in question, by comparing the breeders' diverging reports and ideas, had proved a hopeless failure, a result at which no one who is intimately acquainted with circumstances in the Netherlands will be surprised.

Of late years science has furnished various means to render the study of animal races more exact and reliable. By means of measuring the various limbs of the body it was possible to express pictorially the general build, which again rendered it possible to prove the existence of the constant fundamental forms which have led to the present classification into three species of the native blood-cattle.

The investigation also proved that there existed a close connection between the general conformation of the body and the

* Inspector of New Zealand Dairy-produce in Great Britain.



Herd of Friesian Cows.—Black-and-white.

aptitude for producing either milk or beef, which fact was duly taken into account in the classification, and tended to emphasize the differences between the three groups. Finally, there were found many slight differences in the form of the head, the setting of the tail, &c., which rendered it possible to establish a number of general characteristics of the three groups.

Without wishing to ignore the differences—often really quite important—which will occur inside one group (when taken over a fair range of territory) owing to various circumstances, such as soil, feed, hygienic care, zootechnic exploitation, we are nevertheless fully convinced that, in spite of these differences, the typical characteristics of the species are constant and permanent. It appeared undesirable to subdivide further, since each group comprises various tribes, families, and types. Upon minute examination these show individual characteristics and deviations, which disappear as soon as the external influences to which they owed their existence have ceased to operate. Thus the white-and-black cattle found in the Provinces of Friesland, North Holland, and South Holland (more particularly on the islands of this latter province) all belong to one group, which, however, consists of various tribes, composed of various families in which again individual specimens represent the distinct types.

It was also considered necessary to give a wider meaning to the term "group" or "breed," as, owing to the great development of home trade and marketing, a continual removal and exchange of the representatives of the several groups from one province to another is nowadays taking place.

In each group one colour is seen to predominate over the others, and these predominating colours happen to be different in each of the three groups. This fact led to the proclamation of the predominating colour as typical, whilst at the same time the other colours were discarded. By this means the groups are easily to be recognized, the control of eventual intermixtures of the three groups being also facilitated, whilst the very desirable uniformity of colour is also attained by it. Hence the colour of the coat declared typical for each group was added to the name of the province in which such cattle are commonly met with, so that we now distinguish—

(1.) The black-and-white Holland (H) breed. (The Friesian Herd-book has the name "Friesch" for the same group, and the Province of Friesland lies outside the sphere of operation of the Netherland Herd-book. The real name, "Frisian-Holland," has been curtailed to "Holland.")

(2.) The red-and-white Meuse-Rhine-Yssel (M.R.Y.) breed.

(3.) The black white-head Groningen (G) breed.

The characteristic differences between these groups become particularly evident when they are contrasted with one another. They may be described as follows :—

Coat. — With the black-and-white Holland cattle black predominates. The most typical and sought-after disposition of the colours is for two white belts, one behind the shoulder, and the other in the region of the hips, to divide the body into three black well-defined fields—viz., forehand, back and loins, and hind quarters—the belly being white, and the legs black above the knees and hocks. The black head shows a white spot on the forehead, whilst the blaze frequently occurs. The entire muzzle is generally slate-coloured. Greyish rings marking the transition from black to white, the occurrence of greyish spots on the coronet, hoofs, and cod (scrotum), a yellow spot above the muzzle, though unpopular, are not necessarily proofs of impurity of breed.

In some parts of the Province of North Holland the white colour predominates, and, when the body, with the exception of belly and legs, is entirely dotted with small black spots, gives existence to the so-called brindled breed. Beside the black-and-white colour, the red-and-white is pretty frequently met with, especially in the Province of Friesland. On the whole the red-and-white colour is on the decrease with dairy cattle, so that now only the black-and-white representatives of this group are entered into the Netherland Herd-book with a view to the attainment of uniformity of colour.

With the Groningen black white-heads the trunk is black, the underline and lower chest being white. The head is either entirely white or shows a black field around the eyes, which field is either detached from (*losse blaar*) or passes into the black neck (*vaste blaar*). The muzzle is generally slate-coloured. The legs are black half-way below the knees and hocks, or, which is preferred, down to the pastern (white socks). The posterior part of the udder is black-bordered, being also black at the sides where it meets the floor of the abdomen, but otherwise white. The cod (scrotum) should be black. Not unfrequently we meet with black-and-white legs, white spots on the shoulder, rump, and neck, as well as black spots on the crown of the hoof, and a white scrotum. These deviations are not desirable, but they do not necessarily prove impurity of breed. Entirely white heads are still of frequent occurrence, but they are not in demand, as the pure white-heads are more subject to ophthalmia.

The red-and-white Meuse-Rhine-Yssel breed is red or red and white, a deep red, bordering on auburn, for preference, particularly on head and neck, often attended with a scattering of small dark spots—the so-called "fiery red." The light yellow-red colour is disapproved of. The muzzle is generally mottled or entirely flesh-coloured. A small white spot on the forehead is met with only very rarely; but, on the contrary, a large blaze frequently occurs, especially with the cattle in the so-called "Land van Kuik," in the vicinity of the City of Nymegen. Some few specimens have white heads, and for the rest a colour that reminds one of the roan of English Shorthorns. Undesired are red-and-white legs,

Black-and-white Friesian Bull "Napoleon," No. 7756, N.R.S.

red spots above and about the hoofs, as well as a red or mottled scrotum. With these breeds the detached spots on the crown between the hoofs are particularly disapproved of.

General Aspect. — The first-mentioned group (black-and-white Holland) has the least aptitude for accumulating flesh and fat, but possesses the greatest milk-powers: 6,000 kilograms (13,200 lb.) milk per annum will frequently occur. The black white-head Groningen breed has the least milk-powers with the greatest aptitude for accumulating flesh and fat; while the red-and-white Meuse-Rhine-Yssel cattle fairly hold the mean between the two. The following percentage would express the relation between

aptitude for the accumulation of flesh and fat and milking-powers of the three breeds :—

	Accumulation of Flesh and Fat. Per Cent.	Milk-powers. Per Cent.
Black-and-white Holland breed.. ..	40	60
Black white-head Groningen breed ..	55	45
Red-and-white Meuse-Rhine-Yssel breed ..	50	50

Responsive to its particular aptitude, the black-and-white Holland breed is of an angular build, lacking in smoothness, and only moderately compact about the flanks, but showing conspicuous lacteal marks, particularly in the form of the head, the condition of the coat, and the form and development of the udder, the large blood-vessels, commonly called "milk-veins," which run from the fore part of the udder to a point not very far behind the fore legs, and also the escutcheon. From its long and straight back, its slim finely furrowed neck, its conspicuous large eyes, and its clean-cut face (more exclusively the nasofrontal), this variety of cattle derives an elegance and a nobility which distinguish it from all other dairy breeds of equal mass. The cows are particularly conspicuous for their broad rump, affording ample room for a big square and well-placed udder, which projects a good way in front and behind. The forehand is moderately developed, and rather narrow, though less striking when compared with the hind quarters in the case of the bulls than with the cows. With both sexes, however, the body is comparatively long and a little flat in the ribs, but of great depth, and very roomy in the region of the paunch.

The black-and-white Holland cattle stand 1·30 to 1·42 metres high, and weigh from 560 to 750 kilograms.

The dimensions of the best and second-best full-grown cows and of two-year-old bulls, reared on clay land, average as follows (centimetres) :—

	Length of Trunk.	Height at Shoulders.	Height at Rump.	Depth of Breast.
Cows	168·0	135·7	138·5	72·9
Bulls	172·4	142·2	144·0	75·8

	Width of Breast.	Width between Hookbones (Hips).	Width of Pelvis.	Length of Croup.
Cows	44·9	56·4	51·3	54·3
Bulls	49·0	54·5	53·4	56·1

The principal breeding districts of the black-and-white Holland species are the Province of Friesland and the northern part of the Province of North Holland. From there it has spread over nearly all the other provinces of the country.

The bodily construction of the black white-head Groningen cattle, unlike that of the black-and-white Holland species, may be properly called the "beef type." The body is straight in its lines, well covered, rounded and compact, particularly in front, in the region of the shoulders, ribs, and flanks. The frame is broad, firm-jointed, and nicely proportioned. The lacteal marks, however, are not so prominent as with the Holland species; the general appearance of the former group is not so graceful. The udder, often wanting in volume, is not so well shaped and placed as that of the Holland cattle. The skin of the bulls, though loose and

Black-and-white Friesian Cow "Koningen," No. 10604, N.R.S.

easily handled, is not so soft and pliable; the hair is not so thick and silky.

The Groningen black white-heads possess some other characteristic points. The horns are fine and nearly always properly set, which is not the case with the Holland breed. The head is short and broad, and particularly clean-cut from the eyes to the muzzle, which is capacious. Thanks to its well-proportioned and nicely covered frame, the term "angular" hardly ever applies to the outline of this breed. As to beautiful and symmetrical forms, the Groningen species, compared with the other breeds, is the most favoured. The cows are exceptionally square and level in the region of the rump; the buttocks are straight and deep-fleshed. The bulls, however, are not so well turned in the rear. In the

region of the pelvis particularly the rump is broad, but often sloping; the buttocks are short and rounded, and if there be a tendency to put on an excess of flesh, which often occurs, we notice a bulging quarter behind, resembling that of a horse. With both sexes, but more so with the males, the back is sometimes arched as a result of the carcase being a little over-developed in the rear, which gives existence to a slight difference in height between the hind quarters and the forehand. The tendons on either side of the tail are often weak and too long.

As regards size and weight, the Groningen breed fairly holds the mean between the black-and-white Holland and the Meuse-Rhine-Yssel species. The figures below, arranged in the same order as those given elsewhere for the black-and-white Holland group, show the average dimensions of the Groningen blood-cattle :—

	Length of Trunk.	Height at Shoulders.	Height at Rump.	Depth of Breast.
Cows	165·4	133·0	135·9	72·2
Bulls	170·8	140·5	142·9	75·5

	Width of Breast.	Width between Hookbones (Hips).	Width of Pelvis.	Length of Croup.
Cows	45·7	56·2	52·0	54·0
Bulls	50·0	55·7	54·3	56·2

The black white-head cattle originated in the Province of Groningen, more especially in an agricultural district called Hunsingo. Hence they are often named "Hunsingo cattle." A very important breeding district exists in the Province of South Holland, along the banks of the Ouden Rijn, between the Town of Leiden and the Village of Bodegraven. The species is much sought after either for the dual purpose (the production of beef and milk) or, if such be the chief consideration, for producing beef exclusively. The breed, however, is not so extensively met with in the Netherlands as is the black-and-white Holland breed, owing to the fact that the majority of farmers have more regard to keeping rich milkers, which the Groningen cows are not. Of late years breeders have been very successful in improving the milk-yield of the Groningen cows, but this fact was only attained at the expense of the afore-mentioned rounded and compact aspect. The flesh-forming tendency of this breed, at any rate, remains the more predominant.

The red-and-white Meuse-Rhine-Yssel cattle possess most excellent dual-purpose characteristics, which signifies that the breed is available both for milk and meat production. With this breed the lowness of the forms is always a conspicuous feature. They are wide and deep-ribbed, set on short legs. The back shows a fairly

long top line, owing to the length of the forehand; the space in the region of the last ribs and flanks is rather short, giving the body a compact appearance. The udder, though more voluminous than that of the Groningen cows, is rather narrow and hairy, and it does not project in front and behind. The teats are long and placed close together; the hide is moderately thick and mellow. Characteristic of this breed is the red-and-white head, which is quite hollow between the eyes. The horns are often long and badly set, and the poll is too prominent. Another conspicuous feature is the broad tail-head, which is set rather far forward. A weak point of the frame is found in the rear. The rump of the cows, through rather level, resembles the wedge shape; with the bulls the hind quarters are short and round, and they also lack in the thighs, which often present a sunken appearance at the sides. Solid shoulders not firmly attached to the frame are now and then met with.

The Meuse-Rhine-Yssel cattle are the smallest of the three breeds, but relative to their size they are the heaviest. The dimensions of first- and second-grade full-grown cows and of two-year-old bulls have produced the following averages:—

	Length of Trunk.	Height at Shoulders.	Height at Rump.	Depth of Breast.
Cows	163·7	127·8	130·1	70·2
Bulls	165·3	134·0	136·1	72·0

	Width of Breast.	Width between Hookbones (Hips).	Width of Pelvis.	Length of Croup.
Cows	44·3	54·1	48·7	52·1
Bulls	47·1	52·7	51·7	54·0

The territory where the above species is principally bred extends from the banks of the Yssel in the Provinces of Gelderland and Overyssel, between the Towns of Dieren and Zwolle, to those of the Meuse, in the vicinity of the Village of Kuik. The Kuik specimens, however, are heavier and larger in size than the Overyssel variety. The red-and-white Lower Rhine cattle of Germany are principally descended from the Kuik variety.

During the last few years much attention has been given to the Meuse-Rhine-Yssel species. In such agricultural districts where pastures are much less fertile than those existing in the Provinces of Friesland, North and South Holland, and where cattle may be kept and fed under cover for any length of time, the red-and-white breed is much sought after. On light soil principally, great progress is being made in the breeding of the red-and-white Yssel variety.

It was Mr. Van den Bosch who laid down the fundamental principles of the present Netherland Herd-book Association. A few words may now be said in connection with its organization and method of operation, and of the position the association occupies amongst other societies in its effort to improve the native stocks of cattle.

The fundamental principle of the reorganized Netherland Herd-book aims at the improvement of each of the three native breeds by straight breeding. For this reason, descendants of only such animals are recorded in the present herd-book whose dam and

Black-and-white Friesian Cow "Rosa," No. 14350, N.R.S.

sire belong to the same breed; in all other cases such offspring are looked upon as "bastards," and therefore rejected.

Animals offered for registry whose bodily conformation and specialization for beef or milk production leaves nothing to be desired, but which do not possess the coat proclaimed typical of each of the three breeds, are nevertheless excluded from the herd-book. In consequence of the above, neither the red-and-white Holland, the red white-headed Groningen, nor the black-and-white Meuse-Rhine-Yssel cows and bulls will ever be eligible for registry.

The reorganized Netherland Herd-book Association, which aims at the preservation as well as the improvement of the race, requires

that all specimens, in order to be eligible for record, shall come up to a minimum standard of perfection. Inspections are periodically organized for the purpose of determining whether individuals offered for registry possess the desired degree of excellence. The animals are judged according to a special scale, varying for each of the three breeds, and by which the good as well as the bad points of each individual may readily be ascertained.

Mention having previously been made by me of the Netherland Herd-book Association, I feel that this report would not be complete without dealing with its technical and administrative method of operation. The sphere of activity of the Netherland Herd-book Association extends to all the provinces of the Netherlands but one—that of the Province of Friesland, which possesses a herd-book of its own. The central society has established as many departments as there are provinces, excepting Friesland. These Departments are managed by their own board, and each of them is also represented on the board of directors of the central society. These provincial departments not only render all possible assistance to the head office, but in their localities they principally direct their attention to furthering the use of the herd-book by means of offering premiums to the best exhibits of cattle, granting subsidies to local breeders' societies, &c. The president, in conjunction with the manager and the inspector-general, conducts the current affairs of the society. The executive committee decides on all matters of importance which the president himself would not or could not take the responsibility of, and it also prepares all proposals to be propounded at the meeting of the board of directors.

We find two systems underlying the method of operation of the reorganized society—viz., centralization on the one hand, and decentralization on the other hand. In centralizing the administrative as well as the technical parts of the system at the head office perfect uniformity is ensured in all its operations, which enables the society to fully guarantee the genuineness of all pedigree certificates, and to render them all equivalent. Each of the provincial departments and local breeders' societies may operate according to provincial and local customs. Cattle-breeders are left free to choose the variety of cattle they wish to rear, and they are even allowed to keep and breed two different species on the same farm, provided that they strictly adhere to the principles of straight breeding.

The Netherland Herd-book Association has in its employ two chief officials — viz., the manager and the inspector-general. The

former conducts the office business exclusively; the latter directs all technical affairs, an important item of which is the inspection of cattle offered for registry. The inspections are carried out by inspectors, who are instructed by the inspector-general, and for whose proceedings he is responsible. The inspector-general should be quite an excellent judge of cattle, the more so as the inspectors working under him are also more or less experts. In conjunction with the manager, the inspector-general superintends the operations of the local breeders' societies affiliated to the central association, and he also decides which of the local unions wishing to be

Groningen Breed.—Black White-headed Bull "Marquis," No. 7465, N.R.S.

affiliated should or should not be recognized. The inspector-general, moreover, assists in nearly all cattle-trade transactions; he supplies buyers of blood-cattle with the desired particulars, but he refrains from interfering in all monetary affairs. His principal object in rendering assistance is, first, to bring buyers and sellers of blood stock together, and, secondly, to see that all transactions are conducted on a sound basis. *Bona fide* buyers of thoroughbred cattle nowadays nearly always apply for particulars to the head office of the Netherland Herd-book Association. Both the inspector-general and the manager are salaried by the Govern-

ment, and neither official may be appointed to or removed from office without its consent.

The Netherland Herd-book Association, as has been stated before, seeks to obtain the co-operation of the local societies. This fact should not cause any surprise when it is considered that only by co-operating can the small breeders hope to achieve something in the matter of improving their stock; isolated, they generally lack the necessary means, and often the proper knowledge, to carry out rational breeding. In consequence of the many difficulties encountered by the local societies (the nature of which

Groningen Breed.—Black White-headed Cow "Gertrude," No. 12168, N.R.S.

varies according to local conditions and customs) it is impossible to expect that they should all be equally well organized or that they should conduct their affairs on the same line. There are also a number of local societies, which as yet are but very indifferently disposed towards co-operation, but as soon as such societies have attained sufficient development they may be officially recognized by the central association, which in that case establishes a control over them, and in return grants them all the advantages derived from such affiliation. Such recognized local societies, in fact, are but branches of the central association. Local societies which have

not yet been considered worthy of recognition are not on that account left to themselves. On the contrary, upon request, the head office will assist and instruct these societies in order to bring them up to the desired degree of development.

All recognized local societies are obliged to keep a full set of books for recording the dams, sires, and their offsprings offered for registry in their localities. They also issue a number of forms, which, however, should not be mistaken for those given out by the central association.

Syndicates owning and leasing bulls, and societies controlling the milk-yield, are not officially recognized by the central association, owing to the fact that the local unions are but laterally concerned with such undertakings.

The Netherland Herd-book Association, though established in 1874, became quite a new concern after its reorganization in 1907. The following table gives a summary of the progress made during the four ensuing years :—

Year.	Members.	Recognized Breeders' Societies.	Cows offered for Registry.	Cows registered.	Bulls offered for Registry.	Bulls registered.
1907	2,442	..	1,529	837	523	279
1908	3,325	16	2,858	1,167	809	306
1909	3,713	26	3,399	1,165	767	212
1910	3,850	40	3,406	1,205	716	235

Should the progress made during these four years be maintained there can hardly be any doubt as to the society's future. That the Government has also great confidence in the ultimate success of the society is evidenced by the fact that it has granted a yearly subsidy of £1,250. This subsidy was necessary—almost indispensable —for the expenses connected with the maintenance of an efficient herd-book would be far too considerable to be borne by the members exclusively, the majority of whom only operate in a small way. It is quite clear that the Government granted the above-mentioned financial assistance because it was fully convinced that the improvement of the native stocks of cattle was a matter of national importance.

After a cow recorded in the herd-book has been bulled by a sire likewise recorded, the owner of the cow sends in a statement to the head office. The form containing the required particulars, properly signed by the owner of the cow and the owner of the bull, should be in the hands of the proper officials at the head office not later than six months after the last service took place.

All owners of recorded bulls are in possession of blank schedules, which are issued in book form. These so-called breeding-forms are supplied at fixed prices by the head office and by the secretaries of the provincial departments. A strict control is kept as regards the time allowed for sending in the breeding-certificates to the head office, as well as with respect to the required contents of these papers. As soon as a calf has been dropped, the owner of same fills in another form, also issued in book form. All particulars bearing on the birth of a newly born specimen should be in possession of the proper officials within seventy-two hours

Meuse-Rhine-Yssel Breed.—Red-and-white Bull "Jan," No. 8163, N.R.S.

after such birth takes place. Delay in this respect will render the statements null and void. This rule is strictly adhered to in order to prevent fraudulous substitution of offspring. Very often an inspector is ordered to repair immediately to the breeder of a newly born offspring for the purpose of verifying the correctness of the statement sent in by him. The owner of the calf, besides specifying the colour of its coat, sex, &c., is also called upon to furnish a sketch of the animal so that it may always be identified. Declarations bearing on the birth of calves are considered worthless unless the head office be in possession of the corresponding breeding-certificates. All the statements are kept on file at the head

office, where they serve for an eventual verifying of the origin of the animals in question. Once the preliminary requirements are complied with, the calf is entered into the so-called "register for young stock" under the name of its owner. On the page of entry are also inserted all particulars about the young animal which appears on the two previously mentioned forms. From the register for young stock the record of the calf is finally appended to that of its mother in the herd-book proper. In this book we find all particulars in connection with the external features, productiveness, and descent of the dams and sires, from which data

MEUSE-RHINE-YSSEL BREED.—RED-AND-WHITE COW "BREGGE," NO. 23, N.R.S.

their excellence as breeding-stock may be deduced. The two sexes of young stock, after becoming fully matured, and when coming up to the required standard of perfection, are entered under separate heads into the respective volumes of the herd-book proper.

As has been stated before, there exist three principal genealogical volumes—viz., the register, the herd-book proper, and the one for inserting the pick of pedigree cattle. For inserting the records of each sex, one set, consisting of the above-named three books, is used. As we distinguish three breeds, there are, besides the three registers for young stock, eighteen principal genealogical volumes—viz., six for each breed. The number assigned to the

animals in the herd-book as well as the letters R.S. or S.K., signifying in which of the three books their registration took place, are branded into both horns.

All particulars contained in the printed issue of the Netherland Herd-book are obtained from the principal genealogical volumes. The animals are judged according to a special scale, varying for each breed, which method was definitely adopted after many others had failed to give satisfaction. The system works on a special principle. In order to be eligible for record, both cows and bulls must score 75 out of a possible total of 100 points. The points scored correspond to certain letters of the alphabet, which letters are expressive of the good or the bad qualities of the animals. The cattle are judged by their external points only.

THE VALUE OF CAREFUL OBSERVATION.

C. J. Reakes, D.V.Sc., M.R.C.V.S.

An interesting case has been reported by Mr. G. N. Waugh, M.R.C.V.S., Government Veterinarian, Invercargill. The subject was a cow running on the property of a well-known Southland settler, Mr. George Chewings, who brought the matter under Mr. Waugh's notice. Mr. Chewings had been informed that the animal was wasting away, but instead of taking it for granted that she was suffering from some debilitating disease he adopted the sensible course of making a proper examination of her, with the result that he found a block of wood measuring $3\frac{3}{4}$ in. by $3\frac{3}{4}$ in. wedged in her mouth between the back teeth and the cheek (see accompanying illustration). In writing to Mr. Waugh, Mr. Chewings states, "Judging by the way she was reduced in flesh, I think she must have had it in her mouth quite ten days. She could neither eat nor drink. It was not want of salt that caused her to be eating the wood; there was rock salt in the paddock. One sometimes sees quiet milkers eating things, but this was a wild cow running with a number of others in a grass-paddock."

Though the cow was not lacking salt, it is yet probable that for some reason she had what is termed a depraved appetite, due perhaps to temporary digestive disturbance, and that this induced her to attempt to masticate the piece of wood. It is not at all an uncommon experience to see cows taking pieces of bone, for instance, a practice due possibly to depraved appetite, but more likely to an instinctive craving for phosphatic material due to an insufficiency of this being present in the ordinary food.

As Mr. Waugh states, the case illustrates the value of intelligent and careful observation by stockowners when any apparent departure from ordinary conditions of health is noticed in an animal. An instance of the advantage to be gained by this came under my personal notice some years since. A farmer had reported a dairy cow to the District Inspector of Stock as being affected with actinomycosis (lumpy jaw). Being in the district at the time, I

called at the farm with the Inspector, and on viewing the animal in the paddock she certainly appeared to be markedly affected with this disease. We got her into the shed, however, and secured her in a bail for examination. Then it was found that she had lost one of her back teeth, and that partially masticated grass had worked through the gap left, a mass of this having accumulated between the back teeth and the cheek, causing the cheek to bulge out very noticeably. Apart from this the cow was right in every way.

PAYMENT FOR MILK AND CREAM SUPPLIES.

SUGGESTED SYSTEM OF PAYMENT ACCORDING TO STANDARD OF PURITY.

D. Cuddie.

From the beginning of the factory system of dairying the delivery of pure, clean-flavoured milk for cheese and butter making has been recognized as one of the most important factors in turning out dairy-produce of the very best quality. The question of unclean milk has probably been discussed more frequently than any other subject affecting the dairying industry, not only in New Zealand but in every other dairying country in the world.

From time to time those whose duties have given them opportunity to see the great need that existed for improvement have suggested remedies to prevent the delivery of impure milk, but the difficulties have not so far been overcome. It is well known to-day that there is still need for improvement in this connection, and it is unnecessary to go into detail here to prove the point further than to say that altogether too large a quantity of the milk delivered to our dairy factories possesses faults which could, and no doubt would, be remedied by the dairy-farmers concerned if a practicable method of classifying supplies of milk and paying for them according to purity were in operation.

Before introducing the suggestion it is desired to make, let it be said that the great majority of dairy-farmers are now delivering their milk to the dairy factories in a condition leaving little or nothing to be desired, so that if it were possible to make up this supply separately into butter or cheese a higher average price would be realized on the market than is the case at present. It is a minority of the dairymen whose supplies are at fault, and, needless to say, if their milk were made up separately the article turned out could be sold only at a considerable reduction on present values. But under ordinary dairy-factory practice it is impracticable to sort up the milk into grades and work up each grade separately; neither is such a procedure to be commended, as nobody really wants produce of an indifferent second-grade quality.

Unfortunately, under the present system, which is very largely in general operation, milk and cream is being accepted at dairy factories and paid for at the same price, irrespective of its class or

purity. With the exception of perhaps the very worst lots, which are usually rejected, all grades are mixed together, which has the effect of reducing the whole to a common standard of quality, so that it is impossible in the manufactured article to get the full and unrestricted benefit of the best supplies brought to the factory.

Milk is certainly paid for according to its butter-fat content, but this is merely a quantitative standard, and does not take into account the suitability of the raw material for manufacturing purposes. In making high-grade butter and cheese purity is the vital consideration, yet this does not enter into the question of the price being paid for the milk and cream received at New Zealand dairy factories. In other words, the product accepted from the farmer is not purchased according to its standard of purity or value for the purpose for which it is required. It is pooled, and the same price paid for the high-class milk as for milk of a more or less indifferent standard and from which the best butter and cheese cannot be produced. It is evident that this pooling or mixing of the factory milk-supply is one of the weakest spots in our excellent co-operative dairy system, because farmers who take special care of their supplies have to share equally the loss brought about by their less careful neighbours. To say the least of it, this is unquestionably unfair and certainly unbusinesslike. In any other line of business such unfairness would not be tolerated, and to prove it one need only ask, where is there to be found a body of farmers who would agree to pool their wool, frozen meat, grain, or even fruit, at a common price? Every one knows that such a proposal would be looked upon as absurd. Yet exactly the same principle is practically in general operation in regard to the milk and cream delivered at New Zealand dairy factories to-day, excepting that, of course, in the purchase of milk and cream the butter-fat percentage is taken into consideration.

Under the present conditions dairy-farmers are losing large sums of money every year, and that loss will continue so long as the present system obtains. Unless some step be taken to differentiate between the prices paid for milk and cream of varying degrees of purity the position is likely to become worse rather than better.

After a good many years of experience it must be candidly admitted that the official inspection of milking-sheds, yards, and dairy utensils can be described only as a partial success in raising the standard of purity in factory supplies. The idea may appear correct in theory, but in practice it comes far short of attaining the desired end. Even if inspection were increased tenfold—and farmers would object to such a proposal—it would not be possible to enforce satisfactorily a given set of rules for the treatment and handling of milk and cream on every farm. Therefore, would it

not be infinitely more effective to place the question of improving dairy-factory supplies of milk and cream on a purely commercial basis by paying a reduced price per pound of butter-fat for quantities of raw material which can yield produce of only indifferent quality? In this way the premium that would be paid for the better deliveries would go to the men who deserved it, and not, as at present, be shared by one and all without distinction.

In order to introduce such a scheme it would, of course, be necessary to have the milk and cream from each farm classified by a competent and independent officer, who would visit the factory for the purpose not less frequently than once a week. The date of his intended visit should not be known to the suppliers.

For the purpose of determining the purity of the milk (leaving cream on one side for the present), or rather its suitability for the manufacture of a first-grade product, a sample representative of the day's supply would be taken on the day of the officer's visit and submitted to what is known as the "curd test."

This test is one which has been tried over a long period of years, and has been found to be thoroughly reliable as an indicator of the purity of milk, although, so far as the writer is aware, it has not hitherto been applied to the grading of milk for payment purposes. For reliability as a test for purity the curd test is on a par with the Babcock test for fat, and therefore it could be used for the grading of milk with the utmost confidence. The cost of an outfit for the curd test and the cost of operating it is trifling, and much less than the small expense for operating the Babcock milk-test.

The taking of a sample only once a week may be raised as an objection to a proposal such as this, but it should be borne in mind that except in special cases no examination for quality covers the whole of the product offered for sale, and also that farmers rarely bring good milk to the factory one day and inferior milk the next day.

At the commencement of milk-grading suitable standards could be set, so that while the movement would do an immense amount of good it would not become unpopular with dairymen. For instance, the standard for first grade, for which the highest price would be paid, could be fixed so that the better supplies of milk now delivered would be included in it.

The samples submitted to the grading officer for examination need bear only a number and not the name of the owner. The grader would record his decision on each sample submitted for his inspection, and would hand in a copy of the results to the secretary of the company concerned, who would credit each supplier with the

grade secured for that particular period. The number of days covered by the test could be made coincident with the period covered by the test for butter-fat, which would reduce the extra clerical work involved to a minimum.

For preference, the men selected to undertake the grading of milk and cream should be appointed by the Government, so that their position would be that of independent officials. If the work were properly organized it would be quite possible in most districts for one official to undertake the grading for at least six factories every week, for, with the co-operation of the factory-managers, he could arrange for the samples on which the grading would be based to be taken on the day of his visit.

Dairy companies operating in districts in close proximity to one another could enter into an agreement to adopt this idea and share the cost *pro rata*, which would make the expense to each very moderate indeed. The several amounts could be paid into the credit of the Public Account, and the officer could thus be made entirely a Government official, responsible solely to the head of the Dairy-produce Division of the Department.

The adoption of the curd test for milk on the lines suggested would to a great extent help employers to come to better conclusions on matters relating to faults in the manufacture and care of the cheese for which the employees are responsible.

The grading of cream would, of course, have to be carried out without the application of the curd test for purity, as this test cannot be used in that connection; but the accurate grading of cream by other means is comparatively a simple operation.

The question of paying for milk and cream on an equitable basis deserves the most earnest consideration of every dairy company director and supplier who is anxious to see the dairy industry returning its maximum profit to the producers of New Zealand. I am convinced that if such a scheme as that outlined above were put into operation it would eventually raise the value of New Zealand butter and cheese by at least 3s. or 4s. per hundredweight, and would prove one of the most profitable reforms ever effected by dairy companies in this Dominion.

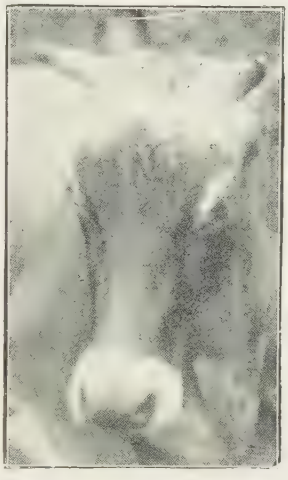
No fear need be entertained that large quantities of second-grade milk and cream would continue to reach the factories, because the prospect of a higher price for a purer article would undoubtedly have the effect of inducing dairy-farmers to strive for the increased returns.

Here is something to show how it works out in practice: The exhibits of cheese at the last Dunedin Winter Show, which were sent Home and placed on exhibition in London to show what New

Zealand could produce under favourable conditions, were in every case made from the very best milk that was being received at the respective factories. The result was that when the cheese came to be sold the whole line realized 70s. per hundredweight, or 4s. and 5s. per hundredweight more than New Zealand cheese was bringing on the market at that time.

In conclusion, it may be mentioned that if the average value of our dairy-produce on oversea markets could be raised by even 3s. per hundredweight it would mean to the producers of this Dominion a sum of over £150,000 per annum on an output equal to that of last year.

MAKING NEW HORN-GROWTH.



In April last my daughters found the shell of a horn of a Jersey heifer which had been knocked off as the heifer was coming into the yard. Later on when the heifer was baled up the shell was placed over the stump, and there it remained until the 14th December. It then fell off when we found that a complete new horn had been formed. The accompanying photograph represents the heifer as she appeared a few weeks after the new horn was discovered. — *J. B. Barleyman, Waitara.*

The average moisture in the last 103 samples of butter in the Danish Government tests was 14·48 per cent.—*Hansen's Dairy Bulletin.*

In writing of the increased activity in the casein industry in Germany Dr. Hittcher, in a *Bulletin of the International Institute of Agriculture*, says the chief uses of casein are in the preparation of paper, colours, and adhesives. When treated with metal salts and formaldehyde, galalith is the result; this, according to the substances added, gives a good imitation of celluloid, ivory, coral, tortoise-shell, &c. It is easily worked and polished, and is not inflammable like celluloid. Artificial silk and horsehair, films, and shoe-creams are also made from casein, while a whole series of food preparations are based on casein: nutrose, eukasin, sanose, sanatogen, plasmon, eulactol, &c., which are sold at disproportionally high prices; thus, for instance, 1 lb. of sanatogen costs 13s. 4d.

ONE OF THE SMALL NEW ZEALAND DISPLAYS BEING MADE THROUGHOUT GREAT BRITAIN BY THE HIGH COMMISSIONER.

CULTURE OF THE TOMATO UNDER GLASS.

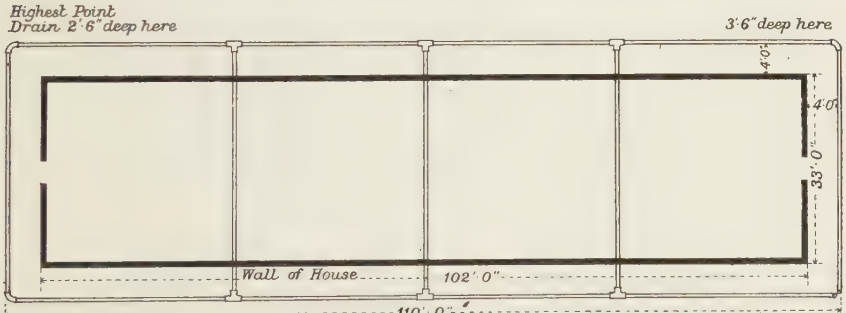
SOME SUGGESTIONS FOR PROMOTING HEALTHY GROWTH.

S. F. Anderson.

That such varying results are met with in the culture under glass of this fruit shows how much there is to learn in the way of controlling the many forms of disease to which it is liable. The present season, on account of unusual climatic conditions, has given more than ordinary trouble in this respect. The following lines of treatment will be briefly reviewed: Drainage of the house and border, soil-management, manuring, cultivation, watering, overcrowding.

Drainage.

Where tomatoes are grown in the soil of the house, and water has to be supplied, the rain-water from the roof and surrounding land has to be disposed of, and can be done only by a reliable system of drainage. The accompanying plan suggests a method of



PLAN OF DRAINING TOMATO HOUSE.

doing this. The size of the house illustrated in Bulletin No. 33 (New Series) has been taken for an example. Assuming the fall to be at one end, then one side drain must be deeper than the other by 6 in. These side drains should extend 4 ft. beyond each end of the house. The fall from the highest to the lowest point in the top drain is 1 ft.—viz., 30 in. to 42 in.; that on the lower one 36 in. to 48 in. The end and cross drains have a fall from the higher to the lower side drain of 6 in. The outlet should be

open, with a good get-away for the water. In digging these drains they should be carefully graded and laid with 3 in. draining-tiles butted close. As these are 1 ft. long, it will take 370 of the tiles, three elbow joints, and six T joints. Before throwing the earth back into the drain on to the tiles cover them with a layer of tea-tree, furze, fern, or strips of old sacking: this is to keep out the dust or fine soil. As drainage is so essential for the aeration, warmth, and the maintenance of the soil in a good condition it should receive first attention, and if carried out one cause of unhealthiness will be removed.

Soil-management.

Directions for subsoiling and preparation of a vine-border have been given in Bulletin No. 40, and can be followed in preparing a tomato-house. If the soil to the depth of 18 in. to 24 in. happens to be good loam trenching it will be sufficient; but, if not, the lower foot of it at least should be replaced with some good substitute, as advised in the bulletin mentioned.

The success of the great market-gardeners of England and the Channel Islands, where such heavy crops of all kinds are obtained from limited areas, is to a great extent due to preparation of the soil by thorough trenching. It is remarkable how readily growers spend a large sum on the building of a fine glasshouse without first considering the thorough preparation of the soil. This should be ample in depth for the roots to penetrate, and for the moisture to go down and also be drawn up without it running together too close for the free admission of air. These conditions can be obtained only where there is drainage, either natural or artificial. Attention to this removes another cause of failure.

Manuring.

Excessive applications of manure are a cause of disease. Where a large number of plants are being grown on a limited area the plant-food supplied is generally greater than that given to field crops. There is, however, a limit to what can be taken up by them or absorbed in a healthy manner; above that it may lead to sappy, useless growth, if not unhealthiness, and is a wasted expenditure. At the same time we cannot overlook that where a large amount of fruit, stems, and leaves are being taken clean away (or should be) adequate return must be made. To give some idea of what that is the following may be mentioned:—

From a house at Palmerston North, 90 ft. by 24 ft., 4,480 lb. of tomatoes were sold — equal to, say, 2½ lb. to the square foot

of house area. From a house in Christchurch, 85 ft. by 25 ft., 9,680 lb. were sold, equal to 4½ lb. to the square foot. Another large house in Christchurch yielded as much as 6 lb. to the square foot. Taking the average of these three places we have the fine yield of 4⅓ lb. per square foot. If the stems and leaves are included, there is taken out of the house fully 6 lb. of green plant material. From a house of the size given in Bulletin No. 33—viz., 102 ft. by 24 ft.—this would be 14,688 lb., or 6 tons 11½ cwt. It has further to be noted that the soil in the open gains a certain amount of plant-food from exposure to the air, rain, frost, &c., which is lost to a great extent to that enclosed by a house. From the above it is seen that nothing is returned at all to the soil from the crop that is grown in the house. We have now to consider the best means of making a return that will maintain this yield and also prevent as far as possible unhealthy growth.

In the bulletin above referred to it has been suggested that to prevent the sickening or exhaustion caused by growing the same crop year after year in the same soil a green crop should be grown between the time of clearing out the house of the one crop and the preparing of it for the next. The reader is referred to page 8 of the Tomato Bulletin on the method of doing this. If the manure be put in with the seed of the green crop it will be available for the tomatoes in its best form, as fermentation and nitrification will have converted it into its most available condition. Where plants are being grown *in a confined space* the gases given off by fermenting manures cannot be conducive to healthy growth. Well-rotted stable manure returns to the soil in the best proportion those plant-ingredients drawn from it, provided it has been well prepared by being kept a sufficient time and turned over at least once. When stacked up for fermenting, a layer of soil—say, 6 in. to 9 in.—should be put on it to retain the ammonia that would otherwise be lost. It will take ten dray-loads each containing 1½ cubic yards to give a layer nearly 2 in. thick over a house 102 ft. by 24 ft. This would weigh approximately 22,400 lb. It is quite safe to apply this manure to the soil of any house.

The artificial manures require more careful consideration. Bone-dust is credited by some in encouraging fungoid disease; nitrate of soda with running the plants into too heavy a growth of stems and leaves. Potash is not always required to be added, because of its existence in most soils, at least of the North. Superphosphate may be applied with the stable manure—about 6 lb. for the above-sized house. If the plants are doing well do not attempt forcing. If, however, owing to soil-conditions, they are not making good

growth, then a little nitrate of soda applied as liquid manure (about 2 oz. to 2 gallons of water) and spread over 5 square yards will be sufficient. Potash requires the most care of any of the manures in garden soils, and unless it is known from analysis the soil is deficient in that plant-food it would be better to apply a small quantity in a liquid form to a marked plot and note the result before applying it generally.

Do not put a lot of manures into the soil of the house because they are manures. The digging-in of the green crop and the stable manure replaces the humus exhausted from the soil. The artificial manures are stimulants, and to be thoughtfully applied to make up deficiencies in the soil itself. The first two or three years tomatoes generally do well. To maintain their vigour the green crop should be started the second year. The manures may be varied slightly each year. Lime may be given every three or four years—say, 150 lb. to the house and border within the limits of the drains mentioned under "draining."

Undermanure rather than overmanure at all times.

Cultivation.

The frequent moving of the surface is most essential not only to promote growth, but to sweeten the air of the house. In importance it comes before manure, because the benefit of manure depends on it. Never stir the soil when wet or too soon after watering. After all the operations among the plants that cause the tramping of the soil, stir up the surface again an inch or two as soon as possible.

Watering.

The atmosphere of the house should be kept dry rather than moist. If the plants were not watered at all they would not die in the soil of the house. The best conditions that can be given them should be such as they would obtain in ideal seasons out-of-doors. By carefully watching the soil of the house much in the same way as a gardener does his pot-plants the grower can maintain the proper degree of moisture for his tomatoes. Do not flood the place from a hose-pipe. Water, and see it sink in before applying more, going over the area several times rather than washing the surface into a close cemented appearance. Avoid consolidating the soil. An oversupply, besides lowering the temperature suddenly, is a serious check to growth. Water in the morning, so that the soil may be warmed up again before night. If the weather be cloudy, damp, or cool, do not water at all.

Overcrowding.

Most visitors to tomato-houses must have noticed how much better the plants on the outside of a row do than do those growing between others. Is this not evidence that if planted farther apart better results from individual plants would be gained? If crowding them encourages disease, which it undoubtedly does, why not plant farther apart—say, 30 in. by 24 in. in place of 30 in. by 12 in.? If the sunlight can reach all round a plant at some time during the day we have in that a great check to fungoid disease. Then there is a greater circulation of air. The plants are not drawn up, and the conditions generally approach more of the outdoor-grown plant, but with the advantages afforded by the glasshouse.

Ventilation.

There should always be a good circulation of air. This should be controlled almost entirely from the top ventilators. Never use the bottom ventilators until the fruit is ripe; even then other fruit may be coming on that may be affected by draught. The improper use of the bottom ventilators is answerable for severe checks to growth by causing cold draught on plants raised in a still warm air. It is obvious how susceptible a soft and succulent plant like the tomato would be to the cool draught made by opening top and bottom ventilators. The sun warming the air in the house causes a drawing-in of the air at the bottom and emitting it at the top.

Farming is hard work and requires a good deal of muscular exertion, yet brainwork will reduce it to less than half.—*Hansen's Dairy Bulletin.*

Wakeman's fescue in the nursery of the Ruakura Farm of Instruction is proving much less susceptible to the attack of grass-grub than the other fescues growing in the immediate vicinity.

At the Village of Chatsworth, in Grey country, Ontario, Canada, the farmers have organized a co-operative selling organization which is a success. Two leading principles characterize this organization: First, quality of product must be first-class. This goes back to methods of growing and handling, all of which, we take it, are under specific rules. Second, this is a non-share company. Heretofore the basis of action has been upon the sharehold principle, and so the business drifted into a joint-stock arrangement upon the basis of dividends. The basis of action or division is upon the amount of business each shareholder does with the organization. This is an important fact to know and provide for in the creation of co-operative selling organizations.—*Farm and Dairy.*

PURCHASES FROM THE DEPARTMENT.

PREPAYMENT SYSTEM INSTITUTED.

From the 1st April, 1914, the present system of sale of goods by the Department on credit will be abolished, and, with certain exceptions, a system of strict prepayment is to be instituted. Persons desiring in future to purchase rabbit-poison, poultry, eggs, honey, or other produce or goods are therefore notified that payment must be made before their order can be filled.

An exception is to be made in the case of large sales of live-stock, produce, &c., from experimental farms, and of large sales of rabbit-poison to merchants and storekeepers.

It is recognized that a great difficulty in connection with the enforcement of strictly cash transactions is that of quoting beforehand freight charges. This difficulty will be reduced as much as possible by the free use of the parcels-post for small parcels, the rate for which can always be quoted in advance, and the making of freight payable forward. There remain the cases where goods must be consigned to flag stations on the railway, and where the Railway Department insists on prepayment of the freight. Rabbit-poison will in future be charged for at a rate inclusive of freight, so that there will be no difficulty with this. Poultry is carried on the railway at rates simply calculated, copies of which rates will be found in the price-lists of poultry and eggs. Inquirers will be quoted a sum to include freight to the flag station, and if there is any difference in their favour it will be adjusted later.

A curious discovery was made a few days ago by a grocer at Southwick, Sunderland. When cutting through a cheese his wire encountered some hard substance, and he was obliged to finish the halving process with a knife. In the centre of the cheese he found a small tin box containing three pennies and a request that the finder would communicate with the New Zealand cheese-manufacturer informing him as to whether the cheese was purchased as New Zealand or Canadian cheese. The tradesman has complied with the request, telling the New Zealand dairyman that the cheese was sold to him as Canadian produce.—*Grocer and Oil Trades Review.*

AGRICULTURE ABROAD.

ACTION OF GREEN-MANURE PLANTS IN THE SOIL, AND THEIR COMPARATIVE USEFULNESS.

From the "Bulletin of the Bureau of Agricultural Intelligence and of Plant-diseases," November, 1912.

Experiments were made by the Agricultural Station at Grignon on the different nitrifying powers of lupins and mustard as green manure. From 1905 onwards twelve successive crops of lupins and mustard respectively were embedded in the soil of two pots; the lupins were at the rate of 79,575 lb. of green substance and 1,670 lb. of nitrogen per acre, and the mustard at 120,420 lb. green substance and 1,600 lb. of nitrogen.

On comparing the nitrogen lost in the drainage waters in both cases it is found —disregarding the quantity of water drained—that it varies considerably: with the lupins the average is 132 mgr. per litre, but with mustard it is only 20 mgr. per litre. This very substantial divergence is due to the different nitrifying powers of the two green manures. In point of fact, assuming a grade of nitrogen in the dry substance of 2·1 per cent. in the lupins and 1·3 per cent. in the mustard on the average, it is found, even allowing for that of the drainage water, that the intensity of nitrification of the lupins is at least four times as great as that of the mustard. It follows that under similar conditions of environment the mineralization of a humus on a mustard basis will take place more slowly than with lupins, which must be preferred, just like other easily humifying and nitrifying leguminous plants, when a rapid utilization of the green manure is aimed at.

Green-manure experiments were carried out in the experimental field of the Royal Station of Agricultural Chemistry of Rome with special reference to the utilization of phosphates. There were two series: (1.) *Leguminosæ:* Vetches (*Vicia sativa, Victa narbonensis*); beans (*Vicia Fab* var. *minor* and var. *major*), *Lathyrus Cicera, L. sativus.* (2.) *Cruciferæ:* Black mustard (*Sinapis nigra*), white mustard (*S. alba*), rape (*Brassica campestris* and *B. Napus*).

The plants were sown at the end of October, 1910, and ploughed in in February and March, 1911; maize then followed. The soil used contained 2·57 per thousand of phosphoric anhydride soluble in nitric acid and 0·23 per thousand soluble in citric acid for control; in addition to the bare patch, three other plots were respectively treated with superphosphate, basic slag, and Gafsa phosphorites, at the rate of 71 lb. of phosphoric anhydride per acre. At the time of ploughing in, the natural acidity of the stem and roots of the plants was determined by extraction with boiling water. From the data thus obtained and those of the yield of maize the following appears:—

(*a.*) The powers of the green manure in rendering soluble the phosphoric acid of the insoluble phosphates varies according to the family of plants.

(*b.*) The Cruciferæ, with a relatively low acidity, turn to equal account, and, under equal conditions of acidity, to better account, than the *Leguminosæ*, the phosphoric acid applied to the soil.

(*c.*) For the same species of plants a higher acidity represents a greater power of bringing insoluble phosphoric acid into solution. Finally, as the acidity of the plants is in direct ratio to their hardiness, it must be held that the hardier the plants the more they utilize the insoluble substances of the soil, both owing to the greater acidity of the juices and the wider spread of their roots.

Practical Conclusions.—As regards the technical application of green manure in agriculture, it must be held that—

(1.) With lupins, and *Leguminosæ* generally, there is a more rapid utilization of the green manure, especially from the point of view of nitrification.

(2.) The crucifers as green manure turn the phosphoric acid in the soil to better account than the *Leguminosæ*.

(3.) Generally, there is every reason for ascertaining by experiment the manurial value of the different green-manure plants, it being a great mistake to think that all plants ploughed in green have the like properties for improving the chemical and physical conditions of the soil.

BELGIAN FARM WOMEN'S CLUBS.

The beneficent influence women may exert in the field of agricultural economics is now recognized by all. But up to recently they had only occupied themselves individually with agricultural interests, without, that is, any institution uniting these new forces for definite and permanent action. Belgium, a country very prolific in social experiments, was among the first to give us an example of what may be obtained by the organization of farm women. And, indeed, by the side of the very numerous agricultural associations, formed for the most part of men, in that country, we find farm women's clubs (*cercles de fermières*) springing up and extending themselves, after the example first set by Canada. The principal inducement for the foundation of these institutions was, as we know, the necessity of arresting the rural exodus that is assuming more and more alarming proportions, and extending itself even among women. It was considered that one of the most effectual means of opposing this tendency would be to appeal directly to the women, to make them appreciate the benefits of the country life and warn them against the delusions and dangers of the cities, as well as give them professional instruction, so that they might be better fitted for the performance of the special duties entrusted to them, such as dairying, poultry-improvement, gardening, &c. The *écoles ménagères ambulantes*, which had been working for many years, already partially supplied the need, but it was necessary that the effects of their work should not be lost. For this purpose the farm women had to be united in permanent associations. There thus arose in 1906 the first *cercles de fermières*, spreading rapidly through the whole of Belgium—above all, through the influence of the Catholic party. It is calculated that there are now more than two hundred of them. Their organization is very simple. During the session of a women's agricultural school the pupils recruit members from among the farm women of the neighbourhood, and the first nucleus of the club is thus formed. It is managed by a lady president, two vice-presidents, three councillors, and a secretary-treasurer. The members pay a contribution of 50 centimes. With this, provision is made for the needs of the society, and articles of domestic use, agricultural implements, selected seeds, &c., are purchased. In the course of the meetings, held generally four or five times a year,* lectures and practical lessons are given, agricultural competitions and shows are held, and lotteries organized, &c. Almost all the clubs also possess a library of books on domestic economy, agriculture, hygiene, dairying, live-stock improvement, gardening, &c. The most widely read newspapers engaged in promoting this movement are the *Fermière* in the Walloon districts and the *Boerin* in the Flemish parts. We give in this connection the following table in which, together with the number of clubs founded between 1906 and 1912, the numbers of members, that of the lectures given, and that of the audience are shown.

* The work of some clubs in 1912 was rather considerable. Thus the Keyem, Moll, Zolder, and Perwes Clubs held ten meetings. The Bonheyden Club held twelve, and the Ter Banck Club thirteen, &c.

Progress of the Farm Women's Clubs between 1906 and 1912.

Year.	Number of Clubs.	Number of Members.	Number of Lectures.	Audience.
1906	2	114	4	90
1907	14	1,961	60	3,324
1908	36	3,931	135	4,181
1909	65	6,162	215	12,447
1910	74	6,929	232	14,209
1911	104	13,273	532	55,713
1912	183	21,461	806	80,143

The number of members shows a continual increase, which is significant. Many clubs have already more than 200 members, those of Ghistelles (222), Berlaer-lez-Lierre (318), Blaesvelt (270), Bonheyden (263), Herve (272), Denderwindeke (260), Grand-Leez (226), Brugelette (291), Wachtebeke (475), St. Marie d'Overmeire (346), Olsene (305), Loochristi (315), Heusden (256), Templeuve (300), Balegem (310), Calcken (591). The numbers of those attending the lectures are also encouraging, and they appreciably increase from year to year.

Federations of Farm Women's Clubs.

Like the other forms of association in Belgium, so also the farm women's clubs tend to unite in federations. First of all, there is the *Comité National des Fédérations des Cercles de Fermières*, presided over by the Baroness Rotsart de Hertaing, to which are due various undertakings which have not a little contributed to the improvement of the associations we are dealing with. This committee, convinced of the utility of an interchange of ideas with regard to the best manner of enabling the farm women to accomplish their work, promoted the third International Congress of Farm Women's Clubs, which was recently held at Ghent (12th–15th June, 1913) under the patronage of the Belgian Government. The committee, in its desire to supply its affiliated clubs with competent lectures, has instituted an examination for a special lecturer's certificate and fixed a severe programme for it. This includes the theory of organization, the purposes and means of action of the clubs, rural book-keeping, the education of children, the question of rural exodus, as well as the study of the means for rendering life in the country agreeable ; it also includes various ideas as to the cultivation of gardens, the sanitation of farmhouses and cattle-stalls, the diet of the peasants, live-stock improvement, women's work, &c. The first examination was held at Brussels on 17th October last. Another question which keenly interested the National Committee of the Federations of Farm Women's Clubs in the past year was that of the agricultural professional instruction to be imparted to the young women of the rural communes. While waiting for a law sanctioning such instruction, the committee decided on organizing a higher course of rural economics, and the success of the lectures given was most flattering. Other federations are,—

(*a.*) *De belgische Boerinnenbond* (*Federation of Farm Women's Clubs*), founded on 5th July, 1911, and on 31st December, 1912, federating sixty-seven clubs with 7,371 members. This federation promoted a meeting on 21st August, 1912, attended by about 1,400 persons. Its sphere of action extends to the Provinces of Brabant, Antwerp, Limbourg, and West Flanders. The organ of the federation is the monthly paper *De Boerin*.

(*b.*) The *Provincial Federation of West Flanders*, which on 31st December, 1912, federated twenty-one clubs.

(*c.*) The *Federation of Farm Women's Clubs of Walloon Brabant* with nine clubs.

(*d.*) The *Provincial Federation of East Flanders Farm Women's Clubs*, which, founded on 29th September, 1911, with eight clubs and 700 members, has now thirty-four clubs affiliated to it, with about 6,000 members. It publishes a monthly review of twelve pages : *De Landbouwster*.

(*e.*) The *Provincial Federation of the Hainaut Farm Women's Clubs*, recently founded, with the object of starting new clubs and encouraging the work of those already in existence.

(*f.*) The *Provincial Federation of the Luxembourg Clubs*, founded on 2nd December, 1912, with thirteen associations.

(*g.*) The *Provincial Federation of the Namur Farm Women's Clubs*, with thirty clubs, constituted as professional unions.

Farm Women's Clubs in the Province of Hainaut.

At the third International Congress of Farm Women's Clubs, recently held at Ghent, Countess Pontbriand, president of the Celles Club, presented a report on the progress of the farm women's clubs in the Province of Hainaut. After mentioning De Vuyst, general manager at the Agricultural Department as promoter of these associations in Belgium, she told the story of the clubs of the province. The first formed was that of Leuze, founded in 1907, but planned in 1906. It has 211 members, and includes the whole territory in its field of action. The next founded were the Celles Club, provided with a library which can boast of many readers and which is the best supplied with works of professional instruction; and the Frasnes Club, the second founded in Belgium, which has 139 members. A peculiarity of this club is that the committee of management has a representative in every commune of the canton, to collect subscriptions and to obtain new members; further, in accordance with a principle of decentralization, it is customary to give the lectures in several communes of the canton, with the twofold object of saving the members' travelling-expenses and arranging a more equal distribution of the advantages the members enjoy and the charges they have to support. We must further mention in this province the Maulde Club (forty-four members), founded in 1909 in connection with an *école ménagère agricole;* that of Brugelette, founded in 1910 and progressing rapidly, so that it has 320 members; and that of Templeuve with 250 members. Clubs of very recent foundation are those of Vézon (1911), Braine-le-Comte, Merlin l'Evêque, and Erbisoeul (1912). The organization of all these clubs is almost the same (contributions, full members, honorary members, and patrons), and they pursue the same educational and professional object, consisting in extending and completing the culture of the farm women, with the object of rendering them more and more capable of fulfilling their social mission. The means employed for this purpose are chiefly lectures and the reading of good books. Considering the object of the meetings of the farm women in the last six years, it is easy to see how the clubs we are dealing with have always acted on the principle of uniting in each sitting, with professional or scientific instruction, also moral or religious teaching, by means of the careful selection of the subjects of the lectures. This is seen in the following list of lectures given between 1907 and 1912 in the Hainaut Farm Women's Clubs:—

Lectures delivered at the Meetings of the Farm Women's Clubs of the Province of Hainaut, 1907–1912.—The farm in history: the hygiene of the farm; improvements to be introduced on the farm; lighting of the farm; live-stock improvement and its future; the fight against aphthous stomatitis; care to be taken in dairying; the hygiene of the cattle-stalls; microbes in milk; buttermaking; poultry-improvement; gardening; horticulture; preservation of vegetables; the farm woman's duties as wife; the farm woman's social duties; the farm woman's day; household education; health of babies; babies' sleep and food; teething; tuberculosis; the development of the will in children; badly trained children; an apostleship to be exercised—anti-alcoholism; the care of the wounded; a new defence against hail; a journey to the Holy Land, with lantern-slides; and patriotism and the mothers.

The moral and religious subjects, as also everything of the nature of recreation (moving pictures, limelight views, &c.), are usually entrusted to priests. The others of technical character are, instead, dealt with, according to circumstances, by doctors, lawyers, schoolmasters, and State scientific agriculturists.

We think, finally, that it will be interesting to reproduce the desires expressed at the Ghent Congress, in relation to the clubs of the Province of Hainaut, by Countess Pontbriand. They were: (1.) That the above clubs may, above all, keep faithful to the line of conduct marked out at their foundation—that is to say, may always include in their programme both professional and moral or religious education. (2.) That the limelight views and moving pictures exhibited in these clubs, even if intended for purposes of recreation, may always have for their object that of developing the sense of the true, the beautiful, and the good. (3.) That the farm women adhering may always become, in a greater degree, participators in the

advantages offered by the professional unions and mutual institutions. (4.) That the number of honorary members and patrons may increase.

The results of these interesting women's organizations in Belgium have been most happy. As is seen in the various publications and reports dealing with the matter, the farm women flock most eagerly to the meetings, take keen interest in the lectures, and derive great profit from them: this appears in no doubtful manner in the considerable progress already observed in poultry-improvement, dairying, gardening, preparation of preserves, and, finally, in every department in which woman's action is prominent.—*Bulletin of the International Institute of Agriculture.*

THE AMERICAN TARIFF ACT.

The following items from the official publication of the United States Government, giving the details of its new Tariff Act, should prove of interest to readers of the *Journal*:—

Free List.

Agricultural implements.

All binding-twine manufactured from New Zealand hemp, &c., of single ply, and measuring not exceeding 750 ft. to the pound.

Any animal imported by a citizen of the United States specially for breeding purposes.

Provided that no such animal shall be admitted free unless purebred of a recognized breed and duly registered in a book of record recognized by the Secretary of Agriculture for that breed; and provided further that the certificate of such record and pedigree of such animal shall be produced and submitted to the Department of Agriculture, duly authenticated by the proper custodian of such book of record, together with an affidavit of the owner, agent, or importer that the animal imported is the identical animal described in said certificate of record and pedigree. The Secretary of Agriculture may prescribe such regulations as may be required for determining the purity of breeding and the identity of such animal. And provided further that the Collectors of Customs shall require a certificate from the Department of Agriculture stating that such animal is purebred of a recognized breed and duly registered in a book of record recognized by the Secretary of Agriculture for that breed.

Coal.

Cotton.

Eggs.

Fruit-plants for the purposes of cultivation and propagation.

Fruits or berries, green, ripe, or dried, and fruits in brine.

Grease, fats, vegetable tallow, and oils, such as are commonly used in soapmaking.

Gum, in which is included kauri.

Hair of horses, cattle, and other animals.

Hemp and tow of hemp, &c.

Hides of cattle, raw or uncured, or dry, salted, or pickled.

Iron-ore, &c.

Lard, lard compounds, and lard substitutes.

Leather.

Maize.

Meat of all kinds.

Milk and cream, including milk or cream preserved or condensed, or sterilized by heating or other processes, and sugar of milk.

Potatoes, fresh or prepared.

Provided that they shall be subject to a duty of 10 per centum *ad valorem* when imported directly or indirectly from a country which imposes a duty on such articles imported from the United States.

Skins of all kinds, raw, and hides not specially provided for.

Skins of hares, rabbits, dogs, goats, and sheep, undressed.
Tallow.
Tanning material.
Timber.
Wax, vegetable or mineral.
Wheat, wheat-flour, semolina, and other wheat-products.

Provided: that wheat shall be subject to a duty of 10 cents per bushel, that wheat-flour shall be subject to a duty of 45 cents per barrel of 196 lb., and semolina and other products of wheat, 10 per centum *ad valorem*, when imported directly or indirectly from a country which imposes a duty on wheat or wheat-flour or semolina imported from the United States.

Wool of the sheep and other like animals, and paper twine for binding any of the foregoing.
Wool wastes, noils, &c., shoddies, mungo, carbonized wool, and all other wastes not specially provided for.

Dutiable Goods.

Wool and Manufactures of Wool.

Cloths, knit fabrics, felts not woven, and all manufactures wholly or in chief value of wool, not otherwise provided for, 35 per centum *ad valorem*.

Differentiation in rate of taxation is made between various manufactured goods, ranging from 20 per centum to 50 per centum, under which duty would fall New Zealand rugs.

Combed wool or tops, 8 per centum *ad valorem*.
Yarns made wholly or in chief value of wool, 18 per centum *ad valorem*.

Agricultural Products and Provisions.

All live animals not specially provided for, 10 per centum *ad valorem*.
Apples, peaches, quinces, cherries, plums, and pears, green or ripe, 10 cents per bushel of 50 lb.
Barley, 15 cents per bushel of 48 lb.
Berries, edible in their natural condition, ½ cent per quart.
Butter and butter substitutes, 2½ cents per pound.
Cheese and substitutes therefor, 20 per centum *ad valorem*.
Dried eggs, 10 cents per pound.
Eggs, frozen or preserved, in tins or other packages, 2 cents per pound; frozen or liquid egg-albumen, 1 cent per pound.
Hay, 2 dollars per ton.
Honey, 10 cents per gallon.
Hops, 16 cents per pound.
Nursery stock, cuttings, and seedlings of all fruit and ornamental trees, 15 per centum *ad valorem*.
Oats, 6 cents per bushel of 32 lb.
Onions, 20 cents per bushel of 57 lb.
Peas, green or dried, 10 cents per bushel of 60 lb.
Poultry, live, 1 cent per pound; dead or prepared in any manner, including weight of the immediate covering, 2 cents per pound.
Split peas, 20 cents per bushel of 60 lb.
Straw, 50 cents per ton.
Yolk of eggs, 10 per centum *ad valorem*.

Foot-and-mouth Disease.—Owing to the fresh outbreaks of foot-and-mouth disease at Home, it has been decided to disallow any shipments of cattle, sheep, and pigs to this Dominion. When the extensive nature of the outbreaks was made known instructions were issued prohibiting the export of all cattle, sheep, and pigs from Great Britain to New Zealand. The prohibition will remain in force until further notice.

THE HEMP INDUSTRY.

W. H. Ferris.

The hemp received at the grading-stores during February showed little or no improvement on that of the previous month. There is a tendency on the part of some millers to sacrifice everything to quantity, by rushing more leaf through the strippers than the machines can strip to advantage, with the result that the vegetable matter is not completely removed, and in some cases is badly crushed. In many instances not only do the after-processes fail to correct the trouble, but they aggravate it. That so many millers are working to a low standard is a matter for regret. The reputation of phormium fibre on oversea markets must suffer seriously if reform is not soon effected. That some millers find it profitable to mill a good-quality fibre is proof enough that there is little excuse for the inferior product being milled—that is, where leaf of decent quality is available. It is recognized that much of the leaf being milled is of an unsatisfactory standard. There is still some grub-affected leaf about, and the excessive flowering of phormium plants this season has a certain effect on the quality of the leaf, which contains less sap, and is consequently of a more woody nature, thus increasing the difficulty of stripping the leaf effectively and the securing of a good colour in the dressed fibre. Where possible, millers would be well advised to cease cutting during April and May, when the worst frosts of the year are experienced. It is the common experience — in the Manawatu district, at least — that these early frosts have a disastrous effect on the young shoots which come away immediately after the leaf has been cut. I know of instances where patches of phormium have been quite killed out by the effect of an early frost on the freshly harvested clumps. Many flax areas would undoubtedly benefit by a spell at the present time, especially in view of the exhausting effect on the plant by the exceptional production of seed-stalks this season.

The export figures for the past month show a high percentage of "common" grade fibre. This has been largely due to a number of millers clearing out accumulated stocks of inferior fibre; and, unfortunately, they have reserved these low-grade parcels for a poor market.

Tow is still being baled in an unsatisfactory condition, many millers failing to realize the necessity of removing the rubbish from this by-product and shipping it in a decent condition.

THE APIARY.

F. A. JACOBSEN.

BY the time this is in print the month of March will be well advanced, and beekeepers will be fully occupied by doing the last of their honey-extracting and preparing their colonies for the winter.

Should the autumn be mild the final extracting may be later than usual on account of a prolonged flow of nectar. Thistles will probably yield more nectar at this period than other plants, and will, when mixed with clover or catsear, produce a white, clear, and delicately flavoured honey, which forms a splendid exporting article.

Should late extracting be necessary, great care must be taken by the beekeeper to check robbing as much as possible. An apiary may soon become demoralized if precautionary measures are not taken. When once robbing starts it may prove a difficult matter to stop. Thousands of bees may be killed by endeavouring to enter their wrong hives, and the strength of the colonies be thereby very much weakened, and even rendered incapable of going through the winter. When robbing has commenced do not open any more hives until the trouble is controlled. This may be done by syringing the entrances of the offending hives with water, and in bad cases by placing wet grass over the entrances until the disturbance has been quelled. Do not on any account leave combs of honey open to attack or keep a hive open an instant longer than necessary. If the colony attacked should be weak, contract the entrance in addition to the above precautions. It may be necessary to suspend work in the apiary during the day, doing as much as is thought advisable in the early morning.

FOUL-BROOD.

At all times of the year foul-brood is a menace to the beekeeping industry, and it is advisable to always keep a sharp lookout for any symptoms of this brood disease. This is especially the case during the spring and autumn months; and before pronouncing any colony fit for wintering examine the brood-nest carefully for the slightest sign of disease. If a trace be discovered, or the disease be found in a further advanced state, judgment must be used as to the advisability of destroying the colony completely or of treating it.

Winter Stores.

Do not fail to determine the quantity of stores available in the hives for winter consumption. Experience has taught keen students of apiculture that a plentiful supply of winter stores is sound economy, and I should advise that about 30 lb. of pure honey be left in each hive. There are occasions when late swarms have not gathered sufficient for their own wintering purposes, and then they must be fed either with clean, healthy honey or with sugar syrup. Never use honey from an unknown source. A leaflet entitled "Feeding and Feeders," supplied by the Division of Orchards, Gardens, and Apiaries, gives all the necessary information in this connection.

Cleanliness.

Before finally leaving the hives it is a good plan to scrape the bottom-boards free of all the rubbish that has accumulated during the summer, thereby helping to keep the bees in a healthy condition. Also scrape the alighting-boards clean, and clear any long grass surrounding the hives, this will tend to keep away dampness. The hives should be placed on blocks several inches off the ground, and should be in a sheltered position where they may receive a considerable portion of the day's sun. Any leaky covers or split supers should be removed from the hives, and sound ones put in their place. Remember bees require dryness and warmth.

General.

At the beginning of last month a very successful field-day was held at Mr. W. H. Gilling's apiary, Matapu, Taranaki, by the South Taranaki Beekeepers' Association. There was a good gathering, including Mr. Buckeridge, in whose hands the export trade of the association has been placed. Others present were Mr. G. V. Westbrooke, Government Apiary Instructor of Auckland, and Mr. R. W. Brikell, secretary of the National Federated Beekeepers' Association. Matters of importance were discussed and demonstrations given in various methods of hive-manipulation. A very profitable day was spent.

A similar field-day was held by the Canterbury Association at Mr. C. A. Jacobsen's apiary, Okuti Valley, Little River, Canterbury, on the 7th February. Mr. Allen, Southland, president of the National Association, and Mr. Bowman, Government Apiary Instructor in Canterbury, were present; also a very large gathering of Canterbury beekeepers. A very enjoyable time was spent.

ORCHARD WORK FOR APRIL.

W. A. Boucher.

Much of the important work of the season will now have been accomplished, but there will still be the gathering and shipping and storing of some of the late varieties of apples and pears.

If it is intended to extend an established orchard, or to plant a new one, autumn planting will prove suitable and preferable to spring planting in many localities, provided the soil has already been properly prepared and climatic conditions are satisfactory.

The planting of suitable shelter is one of the most important considerations in connection with the cultivation of fruit. There are few, if any, localities in New Zealand that are not visited from time to time by more or less severe winds. From these it is essential that the trees should be protected both for the sake of the fruit-trees themselves and to prevent possible serious loss of crop.

Orchard Pests.

But little, if any, spraying will be necessary during the month of April for the control of orchard pests, but it would be as well to procure the necessary materials, such as red oil, bluestone, &c., in order to be prepared for the commencement of the winter spraying.

Cover-crops for Orchards.

Reference has been made from time to time in this Journal to the advantages to be gained by sowing in orchard lands such crops that, ploughed under in the spring, will introduce humus into the soil and so improve its general condition. Early sowing of such crops is desirable, but if this has not already been done rape or mustard may yet be planted with advantage. Both are hardy and will make good growth under conditions which would not be favourable to other vegetation that might be selected for cover-crops.

The object of pruning should not be to make a tree beautiful to the eye, but to bring about the greatest stability in the structure of the tree and the production of the fruit in the right place.

HANDLING APPLES FOR MARKET.

SUMMARY OF IMPORTANT POINTS.

1. Remember that the proper selection, grading, and packing are vital points in marketing of apples.

2. Take care that the fruit is well matured before picking; green fruit shrinks.

3. See that the apples separate easily from the fruit-spurs, or that the pips are beginning to turn brown, before picking the crop.

4. Do not pick fruit in wet weather.

5. Make several pickings from each tree; all apples do not mature together.

6. Take care of the fruit-buds; they will be needed for next season's crop.

7. Apples bruise easily; handle them as carefully as eggs.

8. Pick into old boxes, thus keeping your packing-boxes clean.

9. Pad your picking pail or box, thus minimizing bruising.

10. Keep apples out of hot sun after picking; overheating injures keeping-qualities.

11. Fruit cannot be handled properly without a convenient packing-house.

12. See that it is well lighted and ventilated; packers cannot work in the dark.

13. Provide a packing-table; you will get through more work.

14. Pad the edges of the packing-table; apples are often bruised through neglect of this precaution.

15. Clean up the table every hour; do not continue tipping apples on those at the bottom of the table; remove leaves and dirt often.

16. Wrap all apples for shipping.

17. Apples are more easily and quickly packed when wrapped.

18. Commence the culling of apples in the orchard; separate the good from the bad. This saves time when packing.

19. Pay strict attention to grading; it ensures good packing, and well-graded apples sell themselves.

20. Always use the diagonal pack. It is easy, and fruit carries better.

21. Pack into a clean box; dirty boxes are unsightly.

22. Don't use more wood-wool than is necessary to form a pad for the fruit.

23. If the apples on the packing-table are not up to the grade being packed, set the case down and start another.

24. Pack tightly; slack boxes open up badly.

25. Be honest; pack only sound and clean fruit at bottom, top, and centre of the case.

26. Practice makes perfect; never miss an opportunity to improve.

27. The better the pack, the better the price.

28. Remember there are other competitors in the fruitgrowing industry, and the most reliable always come out on top.

A bulletin entitled "Handling Apples for Market," by Instructors J. H. Thorp and G. Stratford, from which the above "Summary of Important Points" is taken, has recently been issued. Copies may be obtained free on application to the Department.

I do not quite see how a father and mother who are ambitious for their children can gain their own consent to continue to live in remote rural districts under existing conditions. If we devote more enlightened attention to the conservation and development of the people we shall be relieved of much of the concern about the conservation and development of our natural resources.—*D. F. Houston, Secretary of Agriculture, U.S.A.*

Colour in Apples.—According to experiments conducted at the Pennsylvania station none of the fertilizer treatments has resulted in any marked improvement in colour. Slight and irregular benefits are shown by potash and by some of the phosphate applications, but nothing of any importance. The same is true of iron applications, so far as experimental evidence is concerned. Professor Stewart says of the experiments, "These facts again lead up to the general propositions that colour in apples cannot be materially increased by fertilizer applications, and that their red colours are essentially dependent upon maturity and sunlight. Conditions that tend to increase one or both of the latter factors, such as late picking, open pruning, light soils, and sod-culture, tend to increase the red colour. Opposite conditions decrease it."—*Green's Fruitgrower.*

THE FARM GARDEN.

W. H. Taylor.

Vegetable-culture.

A properly managed garden should now be well stocked for winter. Broccoli, Brussels sprouts, savoys, and cabbages should all be in strong growth, and moulding-up should be properly attended to. This is usually completed in two operations; a slight moulding-up is done while the plants are small, and a heavy moulding when the plants are well advanced. I have heard growers complain that they take a lot of labour to weed. This is quite unnecessary. The plants are, or should be, put out at such distances that, when fully grown, they will cover all the ground. The first moulding will check weed-growth by hoeing up most of those between the rows and covering those in the rows. The heavier moulding will cover all that have grown in the interval, and before others have grown the plants should cover the ground. Very few will grow after that. Where the rows are long enough they should the second time be moulded with a plough, or a Planet jun., with double mould-board. Either of these does better work than a hand-hoe, because they break the soil up more and leave it looser than a hoe does. The work is, of course, done in a very much shorter time. In the garden proper the plots are usually given stable manure, or something similar. Where this is done the plants are not likely to want other assistance, for, although the manure will have been some time in the ground, the weather in most parts being dry during the summer months, plenty of it will still remain, being rendered effective by the advent of wet weather. Similarly, where artificial manure has been used it is not likely to be exhausted, for a considerable amount of moisture is necessary to dissolve it. Therefore if growth has been poor it may be for want of rain, and not lack of fertilizer. But when it is known that the soil has not been well manured, and is poor, it will be wise to give the plants some help. Nothing else is so good as stable or farmyard manure, even as a top-dressing, but in large plantations it would be difficult to apply it. Places that

are subject to prolonged droughts are not the best for growing garden stuff, yet vegetables are wanted there as much as anywhere else, and better results could be obtained if such means as are available were taken to compensate for want of rain. Nothing but water, of course, can do the work of water, but a certain amount of moisture can be given to soil without rain or irrigation. The right thing to do is plough or dig in a green crop specially grown, and for this purpose nothing is better than partridge peas. At the Arataki Experimental Farm we are subject to this trouble ourselves, and the intention is to sow down all vacant land with peas. These will serve to keep down weeds, and will give a good body of humus to plough in. This kind of humus contains a lot of moisture, and all humus retains moisture, which not only directly feeds plants, but also helps to dissolve artificial fertilizers and render them available as plant-food.

Sow at once *turnips* for the winter supply. The yellow-fleshed varieties are by many considered the best. One may say, however, that it is only in winter that they are good, or at least they are best at that time, and stand better as a rule than the white sorts. I recommend sowing both—Snowball for early winter, and Orange Jelly or a similar variety for later use.

Lettuces may be planted now in well-drained soil. Raised beds are advisable, unless the ground is naturally warm and always free from stagnant water.

As a matter of course sow at the end of March *lettuce, onions, cabbage,* and *cauliflower.* This is a very important sowing, because it supplies the earliest and best lettuces, the spring and early summer cabbages, and cauliflowers from early in November till past Christmas. Onions are sown now mainly for transplanting in spring, and these, if of the right kind, develop into the giant bulbs. Sow any good variety of cabbage lettuce—Early London, Early Erfurt—and Autumn Giant cauliflower. These will supply a close succession that cannot be got in any other way. Onions, Ailsa Craig, Prizetaker, and Giant Rocca are large kinds. It is well worth while also to sow keeping varieties, as they make finer bulbs than those sown in spring. But they do not keep so well, and therefore must not supplant the spring crop.

It is usual to sow *broad beans* in June, but they may be sown at once, and will come earlier as a result.

Onions should all be harvested by now. Before being stored away they should be overhauled and all imperfect ones thrown out. All loose skins should be taken off, and the tops cut down close, unless they are to be strung up. In the latter case the

tops are required for tying to. If, however, they are stored in heaps—and they will be if there is a large lot—the less that is left beyond the bulb itself the better. All waste tops and skins hold moisture, prevent a free circulation of air, and militate against the bulbs keeping. They should be stored in a perfectly dry place, the cooler the better, with plenty of air.

Winter rhubarb should be given plenty of manure. A heavy mulch of strong stuff will be beneficial. Rhubarb cannot be over-manured.

Asparagus should be cut down before the berries ripen. If the seed gets into the ground it becomes a nuisance, growing like weeds. It is better to cut the tops before they are quite ripe than to let the berries fall. After clearing way the tops the bed should have a good coat of stable manure put on it. Enough should be given to cover completely any weeds there may be. If this is done no other treatment will be necessary until towards spring, when the rough remains of the manure may be raked off.

The Flower-garden.

Sow under glass everything that may be needed that is of perennial or biennial nature, and a number of annuals. Biennials, particularly, should be sown in autumn, because they will then flower next summer. The various dianthus of the heddewigii section are very beautiful plants, more particularly perhaps the double varieties. All the species of stocks, except the ten-week, may also be sown. Among the annuals I regard the nemesias as most valuable for sowing now. They will make a very fine early show. If sown again in spring will combine to make a show all the season, and they are good enough to make it worth while. Marguerite carnations sown at the present time will flower by Christmas, before the perpetuals, and they are useful for all purposes. In speaking of perennial plants to be raised, I am referring to herbaceous flowering-plants, not shrubs. There is no particular advantage gained by raising the latter now, for, as they mostly take a long time to develop, one time is as good as another. Among many good things I may mention a few that are specially useful—Coreopsis grandiflora, delphinium, aquilegia, gypsophila, gaillardia, Iceland poppy, pyrethrum, polyanthus, primrose, verbenas, and pansies. These are types of the class that should be raised at this time. Want of proper methods is often the cause of losses leading to disappointment and loss of a season. It may be regarded as an axiom that the fewer times the soil is watered after the seed is sown, and before the plants appear, the greater the

chance of success. Effort should be made to dispense with watering altogether until the plants are up. There are several reasons why it is dangerous to water—displacement of the seed, washing it out, or covering it too deeply, or injury to the germ, or the soil being alternately too dry and too wet. Where the boxes are properly prepared and treated watering is seldom necessary. Drainage should not be excessive, nor should a material that is likely to dry rapidly be used for drainage. Cinders, for instance, are bad on that account. A layer of sphagnum moss and partly decayed stable manure are both good. The manure should have a preponderance of straw, turned brown by heating. It will then easily decay, holding moisture in the process. After the boxes have been filled with soil this should be thoroughly watered and left to drain. Then sprinkle a little fresh soil over the top and press it level with a dry brick or piece of board. Sow the seed on this surface, and do not water again. Place the box in the frame or house, cover it with a sheet of newspaper, and the paper with a sheet of glass. The combined effect of the paper and glass is to preserve darkness and prevent loss of moisture. In most instances the young plants will appear without giving more water. In cases where the boxes are standing on staging formed with battens, the spaces between the battens, by admitting air through the bottoms of the boxes, may cause drying. For this reason such stages are not the best places to stand seed-boxes on, although that is ruled by surrounding conditions. The great thing to keep in mind is the necessity for preserving a condition of moistness as distinguished from absolute wetness, with, of course, sufficient warmth to raise the seeds.

Bulbs.—All the early flowering species should be got in without further delay. Ranunculus, though they are one of the most attractive of the spring-flowering bulbs, are not very generally grown, for the reason, doubtless, that they are not amenable to the same rough treatment to which most bulbs will submit. Yet they are easily grown where conditions are congenial. The conditions necessary are absence of stagnant water and free soil. They will not thrive in sticky soil. In winter they would most likely rot, and in spring such soil usually becomes very hard. The soil requires also to be fairly rich. It is best when the soil is not quite all that might be desired to provide something additional to cover them with. For the purpose a mixture of good loam and very old cow manure, with sufficient sand to make itself felt, and a dash of soot is a very good compost. Make a drill about 2 in. deep, put in the tubers about 6 in. apart, and cover with the compost.

THE POULTRY INDUSTRY.

F. C. Brown.

April is ordinarily a slack month, but to the keen poultryman it is a most interesting period. Is it not a good time to keep a close eye on many little details and to study breeding and type problems for which busier months do not afford an opportunity? Then, what better time to thoroughly clean the plant and make preparations for the busy months? I can imagine no better opportunity to select the coming breeder—to detect the weak hen and discover the ideal bird for the breeding-pen. Those which are only now showing signs of moulting will appeal to the breeder as birds possessing the necessary stamina combined with egg-producing power. Exceptional birds, of course, may still be carrying their old feathers. It will be too late in the busy months of winter to drain a wet run, to make a house really draught-proof, or to set about the erection of new breeding-quarters, or the making of provision for extended hatching and brooding operations, or to sweeten a run by forking it over and planting green stuff, or rectify anticipated trouble (such as providing fresh burners to incubator-lamps, or new connecting-rods for the machine where the old ones have become bent), or the mending of gates, fences, &c.; but all these things can be very well attended to in the slack month of April. Such work done now will enable the necessary time to be devoted to the critical work of hatching and brooding the new flock. Many poultrymen have failed to rear their chicks as successfully as they really knew how, simply because they have had too much other work to attend to at the time, and have consequently had to neglect their more important duties. "Procrastination is the thief of time," but in poultry-keeping it is the most fatal of all mistakes. There is a time for everything, and April is the month to do all the odd jobs for which time cannot be spared at other periods of the year. Prepare well for the busier season, then the drudgery usually accompanying poultry-keeping will be largely eliminated from the business.

The Winter Layer.

Pullets should now be snugly accommodated in their laying-quarters. Providing they have been hatched at the right time

(the light breeds in September and the heavy ones in October), they should be commencing to lay in April. Great care must be taken in their management. Do not foolishly attempt any force feeding in a sudden manner, but rather continue the plain diet, and gradually introduce the meat ration. Any change in food or management at the present time may prove disastrous. Remember always that the bird is laying out of its natural season, and therefore must be handled with the greatest care. In housing the young stock keep the different ages as distinct as possible so that the feeding and treatment may harmonize with the stage of development of the different-aged birds. There is an individuality in birds as with all other animals, and keeping this in mind will enable rational treatment to be applied. There is altogether too little classification of stock. The best results will never be secured unless the treatment of each pen is in conformity with the special demands of the particular occupants. One of the most common mistakes made in the keeping of poultry is the running of birds of all ages and sexes together.

Constitution.

I feel I cannot refrain from again emphasizing the importance of constitution. Apart altogether from the value of constitution in the maintenance of egg-laying power, this quality must be present in both males and females if disease is to be warded off, and prevention is the only feasible means of fighting disease in poultry. This period of the year, when the birds are in their poorest condition, is the time to detect the evils arising from any weakness in constitution, for it is now that the birds are in their most susceptible state. Therefore remove all sources of infection and provide the very best sanitary conditions. Especially should the diet be nourishing and invigorating. A plentiful supply of the right sort of green stuff is imperative. It is not uncommon to now find cases of roup and the more dangerous tuberculosis. In the case of the former the first symptoms, such as slight colds, should be at once attended to, and an endeavour made to find the cause, which will probably be found in a small draughty opening in the fowlhouse, or insufficient ventilation by closed-in, overcrowded, and dirty quarters. Remedy the cause without delay, and isolate affected birds. A little permanganate of potash (enough to go on a sixpenny-piece in two quarts of drinking-water) will be found useful. In advanced cases of cold the mouth and throat may be swabbed daily with kerosene, but once roup has developed the axe is the only alternative. Tuberculosis, or what is usually

termed by poultrymen "going light," should be carefully guarded against. Should there be any indication of the presence of this highly infectious disease the suspected cases should be isolated and placed in a clean house and run. If any of these are subsequently considered to be affected they should be promptly killed and the carcases burnt. If possible, the whole of the birds in the run where the affected birds first came from should be removed to fresh clean quarters, and the place and everything connected with it thoroughly disinfected, the run being dug over and limed, and the house well sprayed with a strong disinfectant. It is a mistake to allow birds to become run down at this time of the year. Their health must be good if they are to have the power to resist disease.

Selecting the Breeder.

The selection of the most desirable hens for the breeding-pens should have been made ere this. While lateness of moulting is one of the very best indications of productive power, it is not advisable to wait till every bird has moulted before choosing the breeders. Type should be the main guide, and it is necessary if the best results are to be secured that this principle should be appreciated, for there is more in securing the ideal stock aimed at than the mere choosing of the parents. Hens should not be put in a breeding-pen after every egg has been forced from them and when they are in an exhausted condition. Such birds must have a good rest before being bred from. If the birds are chosen by type they can be marked as breeders before the end of an exhausting season; and thus, by lighter diet and exercise, or a change of diet and change of quarters, be discouraged from laying to their extreme capacity, and thereby be given every opportunity of building up their vitality before being called upon to lay eggs for reproductive purposes. Again, if the selection of the breeder is left till the flock has moulted, the accurate choosing of the most desirable hens is made a matter of great difficulty, for all late-moulters are not the best breeding-stock; and it is exceedingly difficult to judge by type when a bird is moulting or has not fully recovered from it. Even the most keen judges on form will admit that it is practically impossible to accurately judge the value of any character in a fowl when it is in any stage of the moulting process.

As to the merit of late moulting and type, I cannot emphasize the fact too much that the best layer is not necessarily the best breeder. While saying this, I do not depart one jot from the

stand I have always taken that the late moulter is the more desirable bird to breed from, but this view has been expressed in a general sense. The best breeder is always a late moulter, but a later moulter is not necessarily a desirable bird to breed from. Type and constitution are the two great factors. I have seen a bird of great laying type and of undoubted productive capacity (proved by trap-nesting), and yet, in my opinion, she was an undesirable breeder, simply because she had been bred too fine, and was a mere weed. Obviously the use of such a hen to perpetuate the species was inviting degeneration and a loss of laying-power in the stock. The other day I inspected a flock of high-type layers, but I could not point to a single desirable breeder among them. They were all weeds. It was easy to foresee that if birds of such a type were consistently bred from it would not be many years before they would degenerate into bantams.

From a recent experience I would emphasize the necessity of never taking advice too literally—that is, in the application of a principle. All the circumstances surrounding the stock and their early management should be considered. In saying, for instance, in a recent number of the *Journal* that the late moulter was generally the best layer and breeder, this assumed that the birds were bred at the usual time and were fed for egg-production right throughout the season. If the birds were hatched at a very early stage—say, in July—and, being of exceptional laying type, were not forced for egg-production with a view of ensuring their vitality and consequent value as breeders, then they would naturally be early moulters in comparison with birds hatched in October and forced for egg-production right throughout the season. No rule is capable of universal application, and local experience must be considered before applying advice on any point connected with poultry-keeping.

There is no more difficult problem in poultry-keeping than securing the type aimed at, and if the poultryman has been fortunate to attain his desired object, then he should certainly do all in his power to secure as much of the blood as possible. For instance, if a certain mating of year-old hens with vigorous cockerels has produced the type of pullet desired, then it is obviously the right policy to pursue to breed the same hens back to the same sires the next season, and even the next. Though it is not profitable to keep a hen for laying purposes beyond the second season, it may pay well to keep her for several years if she has thrown exceptional stock and is a strong type of bird.

THINGS TO REMEMBER.

The winter layer must be fed under shelter, and not be compelled to wait about in a wet yard for food.

Because the birds are not laying do not neglect them. Producing feathers is often more exhausting than producing eggs.

Good stock and their breeder are often condemned because the purchaser fails to give the birds the proper attention.

It is not a high return from a few birds which makes for profitable production, but a good average from the many.

Do not expect winter eggs if you have not provided proper scratching-quarters, where the layers may be made comfortable in cold and wet weather.

In culling remember that it costs as much to keep a poor producer as it does to keep a heavy layer, and it is the net profit that counts.

Do not blame the hen if you fail. With the laying-blood and knowledge now available everything depends upon the man behind the birds.

The producer is not always to blame when a stale egg reaches the breakfast-table. Keeping eggs for days behind a plate-glass window in a city shop has something to account for.

It takes years to work up a good laying-strain, but only a short time to lose it when constitutional points are not considered in the breeding-pens.

Under no consideration keep fifty fowls when you have only room for twenty-five, and only sufficient time to handle these to advantage.

To be a successful poultry-keeper you must have purebred birds. A first cross is, no doubt, profitable, but it takes two purebred birds to produce it.

Do not think because you cannot see vermin in the house that they are not there. Some of the most dangerous parasitic pests of the fowl work at night and hide themselves by day. Spray thoroughly, especially the corners and crevices. Make the warfare as thorough as possible.

A Hanley (English) tradesman was recently fined three guineas and costs for a breach of the Merchandise Marks Act in selling Russian eggs as "new laid." And Russia is nearer to England than is New Zealand.

ANSWERS TO CORRESPONDENTS.

CORRESPONDENTS are requested, when desiring information through the Journal in regard to disease in animals and plants, to forward, where possible, affected specimens, in order to facilitate a correct diagnosis of the trouble and to ensure the best advice. In stating a question the most complete descriptive details should be furnished.

Correspondents desiring information in regard to manurial treatment of soil are requested to fill in and forward the prescribed form—"Application for Advice as to Manurial Treatment of Soil"—obtainable from any office of the Department in the Dominion.

In every instance a question to which an answer is desired in these columns must be accompanied by the full name of the inquirer, not necessarily for publication, but as a guarantee of good faith.

LAWING DOWN PERMANENT PASTURE.

"TUSSOCK," Fairlie :—

Could you advise me what would be a good mixture to sow on land of fair quality in order to obtain as permanent a pasture as possible? Could I sow down oats in the autumn and harrow the grass-seed in in the spring, or would it be better to sow both together and chance the damage the severe frosts we get may do? Would you advise sowing some fescue?

The Fields and Experimental Farms Division :—

It would not be advisable to sow the oats in autumn and afterwards sow and harrow in the grass-seeds in spring. For a permanent pasture, if the land is clean, sow the grasses in autumn and harrow the seed in with tine harrows. Experiments conducted in various parts of the South Island for a series of years go to show that there is a great wastage of seed and consequently poor pastures through not putting the seed in sufficiently deep. If it is desired to sow oats with the grass the seeding of oats should be light. Mixture: Perennial rye-grass, 5 lb.; Italian rye-grass, 5 lb.; tall oat-grass, 5 lb.; cocksfoot, 8 lb.; meadow-fescue, 2 lb.; rough-stalked meadow-grass, 2 lb.; timothy, 1 lb.; cow-grass, 4 lb.; alsike, 1 lb.; white clover, 2 lb.

ORCHARD AND GARDEN DISEASES.

MR. W. HOPKINS, Rangitumau, Masterton :—

I am sending under separate cover samples of various blights which have taken possession of my garden. I would be pleased to have your opinion as to what is the cause, and what would be the best remedy to apply to get rid of the various blights.

No. 1 specimen: The raspberry-canes in spring appear quite strong and green until they blossom and the fruit sets. Then they gradually die off, and then appear as if a fire had been through them. This is the second year the trouble has appeared, and I may say the bed is some ten years old and has been kept clean and free from weeds.

No. 2: Specimens of apples from half a dozen trees. The fruit this season on most of the trees shrivelled up, and fell off some five or six weeks after the fruit set.

Nos. 3 and 4: Blights affecting most of the trees. The trees are quite clean and devoid of scale and woolly aphis. They were sprayed in winter with red oil, and in spring after fruit set with vermorite, 1 oz. to 4 gallons water.

The Orchards, Gardens, and Apiaries Division :—

No. 1 : The raspberry specimens received have been attacked by leaf-blight (*Septoria rubi*). This disease can be controlled by spraying with the Bordeaux mixture, winter strength, just before the buds begin to swell, and once or twice later, after the leaves have opened, with the Bordeaux mixture, summer strength.

No. 2 : The cause of the fruit shrivelling and falling off has apparently been lack of fertilization.

Nos. 3 and 4 : Specimens attacked by mildew. Spray with the Bordeaux mixture, winter strength, when the buds have commenced to swell, and once or twice later, after the leaves have opened, with the Bordeaux mixture, summer strength.

Toad-flax.

Mr. Rowland Guinness, Farmleigh, Ealing :—

I enclose a flower and leaf of a weed which is growing in one of my paddocks. Would you please tell me if it is a noxious one, and whether it would be injurious to stock, as the paddock was in oats this year and I intend to cut the stack for chaff, and as this weed is in some of the sheaves I am anxious to find out more about it before giving the chaff to my horses.

The Biologist :—

The plant sent is toad-flax (*Linaria vulgaris*). Its presence in chaff is not harmful so far as feeding of the chaff is concerned, but is bad from the selling point of view, as clean chaff always commands a higher price than weedy lines. Toad-flax is liable to spread over a paddock owing to its being provided with underground stems like Californian thistle. Fallowing and cultivation is necessary to eradicate this weed. A potato crop is a good one to employ on land containing toad-flax, but of course this is not feasible in light land. The plant does not appear to seed very freely in New Zealand.

Macrocarpa-trees.

"Inquirer," Mangatainoka :—

I have some macrocarpa-trees which have been allowed to grow too big. When is the best time to cut them down, so as not to kill them? Would you advise me to cut tops and side branches at the same time, or, say, side branches this year and tops next year?

The Orchards, Gardens, and Apiaries Division :—

The hard cutting of macrocarpas frequently has the effect of killing the trees. The best time for cutting is in the early spring. It would be desirable to remove the tops one season and cut back the side branches the following season.

Japanese Plum.

"Farmer," Toatoa :—

Some seven years ago I planted a Japanese plum ("Akarana"). This tree has grown remarkably well, but, unfortunately, bears no fruit, although every spring it is a picture to look at, being covered with blossom. During the early summer I have found numerous growths, about an inch long, and upon examining these have found them to be hollow. After a week or so they wither and drop off. The tree is densely covered with healthy leaf, and makes a big growth every year. Could you tell me if there is any way of making the tree fruit-producing?

The Orchards, Gardens, and Apiaries Division :—

Your plum-tree is apparently attacked by a fungus disease known as "bladder-plums," "pocket-plums," &c. In order that this disease may be kept

under control the trees should be sprayed in the early spring, when the buds are beginning to swell, with the 10-10-40 formula of the Bordeaux mixture, and again, if necessary, with the summer formula of the same mixture once or twice after the fruit has set. Directions for making this spray will be found in the departmental spray leaflet, and a full description of the disease is given in Leaflet for Gardeners and Fruitgrowers, No. 18. Both leaflets may be obtained from any agency of the Department.

Grass.

"Subscriber," Mauku, Pukekohe :—

Please inform me of the name of the enclosed grass, &c.

The Biologist :—

The grass is a large form of fiorin (*Agrostis stolonifera*), a useful grass on poor country where the better European grasses do not hold. Sow at the rate of from ½ lb. to 1½ lb. per acre in mixtures.

Planting Trees in Wet Land.

Messrs. J. Machell and Russell, Gisborne :—

Parallel with the seashore at Gisborne we have what has been the Waenake Creek, but on account of silting during floods for six months of the year it is now only a bog growing raupo. This week, after cutting a track through the growth, I drove lambs across a distance of about 4 chains. At two miles and a quarter from its outlet into the sea and river we have a large deep lake, 5 ft. 1 in. above Admiralty low-water mark, but as the low level is only reached about two or three times a year we are advised to reduce our fall by 1½ ft. to 2 ft. A local engineer's opinion is that this cannot be drained, and he advises us to sow gum and willow trees. If such is your opinion, will you kindly let us know what trees to plant, and in what month of the year?

The Orchards, Gardens, and Apiaries Division :—

We would advise planting willow-trees early in the month of August.

Shelter Hedge.

Mr. W. P. Bronbend, Poihakue, Coromandel :—

What do you consider the best hedge for shelter to a flower-garden (sea frontage)?

Also the proper time of the year to plant same?

The Orchards, Gardens, and Apiaries Division :—

Coprosma Baueriana, commonly known as "taupata," makes a first-class hedge in districts bordering on the sea-coast. The plant is a quick grower, and can be raised from cuttings put in during March or April in a cool moist spot. It is, however, much more readily grown from seeds.

Mix the berries (if obtainable) in damp sand for the winter and rub them through the hands or a sieve to separate the seeds. They can be sown either in the place where the plants are to remain permanently, or in spade-wide drills in early spring, and transplanted when about 1 ft. to 18 in. high.

Plant for Identification.

"Southerner," Te Kuiti :—

I am forwarding you a plant that I came across in one of my paddocks. Not having seen any similar plants during my farming in the south I would like some information about it. Is it a noxious weed?

The Biologist :—

The specimen sent is yellow star thistle (*Centaurea solstitialis*). This weed is included in the Third Schedule of the Noxious Weeds Act. It does not appear to spread very much in New Zealand, but it is advisable to pull up any plants that are noticed before they have seeded.

Warts on Cows' Teats.

"Spanker," Pakaraka, Bay of Islands :—

1. Are warts on cows' teats contagious ?
2. What is a good practical cure for them ?

The Live-stock and Meat Division :—

1. These are generally regarded as benign, non-recurrent, persistently local new growths, frequently developing after some chronic inflammatory irritation of the skin. Probably the process of milking by hand may account for their common occurrence on the teats, although they are often found on animals that have never been milked. There is a current belief that if warts are made to bleed they will spread wherever the blood runs. We do not think there are any grounds for this supposition. There is no doubt, however, that the papillomatous growths which sometimes affect the vagina of the female and the glans penis of the male are transmissible by coition, and these have been also transmitted experimentally in dogs.

2. Snip them off with a pair of clean, sharp, curved scissors, touching the wounds made with nitrate of silver (lunar caustic).

Calf with Disease of Skin and Hair.

"Subscriber, Ngatimote :—

I have a calf about three months old which has scurf all over it. The hair has come off round the eyes and the ears, and the coat stands on end. The animal is in fair order, and has a good appetite. It has been fed and is running with two others which are healthy and have done well. Will you please tell we what to do for it ?

The Live-stock and Meat Division :—

Without examining the animal it is difficult to say what is causing the condition. Try dressing with a non-poisonous dip, the same strength as advised for dipping sheep, and repeat in about ten days. If this does not answer write again.

Alsike (Clover).

Messrs. O'Donnell Bros., Hauturu, Kawhia :—

1. Is alsike (clover) valuable in point of nutrition, or does it possess very little feeding-value ?
2. Does it usually hold long in the ground ?

The Fields and Experimental Farms Division :—

Alsike is a highly nutritious clover—as good as red clover in this respect. The length of time it persists in a pasture depends largely on the type of soil on which it is growing and the class of stock grazing on it. In light soils it usually does not last more than three years, although if the rainfall is abundant and opportunities are given for it to seed it may last longer, especially if grazed by cattle. On stiff, moist soils it may persist for seven or eight years, especially if not too heavily stocked. In all cases it has a longer duration on cattle than on sheep country, and in certain heavy country can almost be looked upon as permanent. It is generally sown on moist soils, ½ lb. to 1 lb. of seed being used in mixtures. The majority of the seed is imported from Canada, and frequently contains Californian

thistle, so that great care has to be taken in securing thistle-free lines. The germination capacity is generally in the neighbourhood of 90 per cent., and the price varies from about 8d. to 1s. per pound.

SHANK-BONE, OR METACARPUS, OF THE SHEEP.

MR. TAYLOR WHITE, Wimbledon :—

Re the shank-bone, or metacarpus, of the sheep: I have noticed that this bone, when immature or not fully ossified—in fact, the bone of a young lamb—when exposed to the influence of the weather will have the knuckle, or joint, detached from its shank or upper length, giving the impression that the knuckle had been held in position by a gristle attachment not yet fully ossified. This knuckle might be described as in duplicate as compared with that of the cannon-bone of the horse. The break of separation in the bone is in the form of the capital letter W, so far as my memory serves. What is the meaning of this false joint in the immature bone of a young animal? Would a similar weakness be seen in the bone of a foal? As the horse has only one knuckle to this corresponding bone, I would assume that in the foal this separation of the knuckle would be in the form of a V. As a study in evolution this question may have some value.

The Live-stock and Meat Division :—

This is not a false joint, the separation being due to unossified cartilage. Ossification of all long bones takes place from centres in the original cartilage. These centres of ossification are always three in number in a long bone, one situated in the middle of its length, and one at each extremity. The process initiated towards the centre of the shaft eventually meets that which began in the extremities, and ossification of the bone is then complete. Until this occurs a bone, if macerated, will always resolve itself into three distinct pieces, which separate owing to the destruction of the as yet unossified intermediary cartilage. Yes, the bone of a foal or any other young animal would also separate, but, as you say, there would be a difference in the shape of the detached pieces.

STRAYING CATTLE.

"SUBSCRIBER," Mauku, Pukekohe :—

Will you please inform me of the particulars regarding the law as to straying cattle, as we have a calf here that broke in a week or two ago?

The Live-stock and Meat Division :—

We cannot undertake to answer law queries regarding Acts over which we have no jurisdiction. The information asked for will be found in the Impounding Act, 1908, but, as much depends upon circumstances, it would be advisable for you to put full particulars before your solicitor and act upon his advice.

TUTU.

MR. MARCUS HERBERT, Alfredton :—

Would you be good enough to tell me the cheapest and most effective means of getting rid of tutu? We have lost a number of cattle, and have a fair quantity of tutu on the place.

The Fields and Experimental Farms Division :—

Tutu is very difficult to eradicate. After cutting, the underground stems rapidly shoot up again. If there is only a small quantity to deal with, grubbing the plants may be undertaken, but where present in large amounts cutting and burning is the only method to adopt. In heavily stocked ground tutu may be crushed out, but, of course, strange stock will suffer. After burning, grass-seed should be sown, because when there is an abundance of young grass tutu is generally not eaten.

WEATHER FOR FEBRUARY.

D. C. BATES.

BETWEEN the 1st and 5th of the month a westerly low-pressure area of a cyclonic type, in its passage over the Dominion, caused very unsettled conditions. Heavy rains occurred at this time in many parts, particularly in South Canterbury and northern Otago. On this account these two districts show an aggregate rainfall considerably above the average.

Several of these disturbances, but of minor intensity, had an unsettling influence on weather-conditions about the 11th, 24th, and 26th, but on the whole the month was one of fine and warm weather.

With the exception of the two districts mentioned above, precipitation was everywhere below normal.

DISTRICT NOTES.

Chiefly from Telegraphic Reports.

District.	
1, 2, 3, 5, 6.	The rainfall in these districts was nearly everywhere less than half the average, the month being one of fine and dry weather with the exception of the first few days and the 13th and 25th. On the 13th some stations recorded heavy rainfall.
4.	The observer at Upper Mangorei measured 4 in. of rain on the 24th, and other stations had heavy falls on this day. Much rain fell also on the 13th, accompanying an electrical disturbance. For the whole month, however, the total precipitation was below the average by about 30 per cent. Fine and warm weather predominated.
7, 8.	About 35 per cent. below the average rainfall was recorded, the greater proportion of the total falling during the twenty-four hours of the 13th. At a few stations over 2 in. fell on this day. With but few exceptions the days were fine, with high temperatures ruling.
9, 10.	On the whole the month was one of fine and warm weather, with light to moderate northerly winds predominating. Gales were experienced in parts on the 11th and 25th, and on the latter date occurred a cold snap which was followed by frost inland on the morning of the 26th. The aggregate rainfall ranged from about 15 per cent. to 45 per cent. less than the average for February. On the 1st and 3rd several stations in district No. 10 experienced rather severe thunderstorms.
11, 12, 13.	In the west coast districts the departure from normal rainfall averaged about 25 per cent. below. The wettest days were generally the 11th, 12th, and 23rd, while the remainder of the month was generally fair.

172° 30' E.
Cape Maria Van Diemen
Russell
Hokianga Heads
Kaipara Sig. Stn.
Auckland
Manukau Hds.
Thames
Hamilton
Raglan
Kawhia
Tauranga
Cambridge
Rotorua
Taupo
East Cape
Gisborne
New Plymouth
Cape Egmont
Napier
Patea
Wanganui
Palmerston N.
Foxton
Castlepoint
Wellington
Farewell Spit
Nelson
Blenheim
Cape Foulwind
Westport
Cape Campbell
Kaikoura
Greymouth
Hokitika
Bealey
Christchurch
Lyttelton
Ashburton
Okuru
Mackenzie Country
Timaru
Queenstown
Oamaru
Clyde
Dunedin
Port Chalmers
Puysegur Pt.
Invercargill
Balclutha
Nuggets
Bluff
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NZ MEAN TIME

District.

19, 20. About 15 per cent. below the average rainfall was recorded. Unsettled conditions prevailed during the first four days; but for the rest of the month very little rain fell, and fair weather was the predominating feature.

14, 18. Fine and warm weather was experienced, with a rainfall slightly below the average.

15. With the exception of the first few days of the month, the 10th and 11th, and about the 23rd, when cloudy and unsettled conditions were experienced, the weather was on the whole fine and warm. 20 per cent. less than the average amount of rain fell.

16, 21, 22, 23. Heavy rains occurred in the early part of the month, but during the latter half fair, and at times very warm, weather was experienced. The total rainfall was considerably above the average in all these districts.

24, 25. In both these districts the difference from the average rainfall varied considerably, some stations recording above and some below. The beginning of the month was extremely unsettled, and also from the 23rd to the 25th. Fair conditions prevailed during the rest of the month.

In a test conducted in Prussia between two methods of pig-feeding—from an automatic hopper (a system common in grain-growing districts of Canada) and from an ordinary trough—the result was slightly in favour of the latter system, the net profit working out at 19s. 3d. per head, against 18s. 10d. for the hopper pigs. The cost of production per hundredweight was £2 8s. with trough feeding, or 2d. less than under the hopper method.

Rabbit-poisoning.—Following is a recipe of a poison which is giving splendid results in the destruction of rabbits under the present weather-conditions in Te Awamutu: 10 lb. apples, 8 lb. sugar, 1 oz. strychnine. Put the apples through a mincer, add the sugar, and boil until a good jam results; then thoroughly mix in the strychnine. Lay about half a teaspoonful on each sod. From the results already secured I am of opinion that the recipe has been very successful, and is worthy of more extensive adoption.—*C. E. McPhee, Inspector of Rabbits and Noxious Weeds.*

Adulteration of Butter.—In Milwaukee, U.S.A., the Chief Milk-Inspector of the Board of Health Department recently unearthed a fraud which has created a sensation in the butter-market. As a result of a test of some butter which appeared abnormal it was discovered that the sample was adulterated with flour and contained 20 per cent. of moisture. Further samples of the same brand proved to be of similar character. The Government officials forthwith investigated the matter, and finally several thousand pounds' worth of the goods were seized. So far as is known, this is the first case of its kind to come under the National Pure-food Laws.—*Butter, Cheese, and Egg Journal.*

THE FRUIT CROP.

The officers of the Orchards, Gardens, and Apiaries Division report as follows on the condition of the fruit crop at the end of February :—

Whangarei.—Apples: Mid-season, medium to good; later varieties heavy. Lemons: Fair crop. Nectarines: Crop finished. Peaches: Only late varieties left; these are heavy. Pears: Late varieties heavy. Plums (English): Crop nearly finished. Plums (Japanese): Crop finished. Tomatoes: Fair to medium crop. Oranges: Showing a marked improvement; most varieties carrying a good crop. The weather has been dry, and a good rain is needed, more especially for the oranges on the volcanic soil. Tomato-caterpillar (*Heliothis*) has been much in evidence. There has been quite a marked increase in mealy bug in northern orchards, more especially on pears. I am glad to report that the consignments of apples and pears now coming forward are becoming more free from infection by codlin-moth. The cannery is again in full swing here this season.—*J. W. Collard.*

Auckland North.—Apples: In full supply; prices fair. Peaches: Glut practically over; in moderate supply; prices advancing. Pears: Heavy crop; unfortunately, some growers substituted lime-sulphur for Bordeaux mixture for *Fusicladium,* with unsatisfactory results. Plums: Main crop over; late varieties in fair supply. Tomatoes: In fair supply; plants feeling the effect of continued drought.—*W. C. Thompson.*

Auckland South.—Apples: Good crop; colour also good. Apricots: Crop finished; prices were good. Lemons: Good crop. Nectarines: Crop nearly finished; growers received good prices for their fruit. Peaches: Crop fair, now practically finished. Pears: Good crop. On account of the humid weather in the latter part of last month and the beginning of this, pear-scab is again prominent. Spots of infection are small but numerous. Plums (English): Crop practically finished; a few Sydney late varieties only left on market. Plums (Japanese): Crop finished. Strawberries: Crop now over. Tomatoes: Supply diminishing fast; plants wanting rain badly.—*N. R. Pierce.*

Hamilton.—Apples: Crops looking well; all varieties maturing earlier than usual; prices for good grades fair. Pears: Very plentiful. Owing to careless handling and packing a good deal of the fruit arriving at markets in very poor condition. Plums (English): In fair supply. Plums (Japanese): Scarce. Peaches: Still plentiful; prices rather low; late varieties promising a good crop. Nectarines: Practically all harvested. Lemons: Scarce. Tomatoes: Looking well; crops of Carter's Sunrise variety are looking exceptionally well, and show very little blight.—*T. E. Rodda.*

Poverty Bay.—Apples: Very good crop, and in the larger orchards very free from codlin-moth. Lemons: The district is absolutely bare of lemons at present; fair promise. Nectarines: Have been a fair crop; almost over. Peaches: Have been very variable; crop now over, with the exception of late varieties, which have fair crop. Pears: Generally a fair crop; black-spot prevalent in many cases. Plums (English): Very few now left. Tomatoes: Poor crop. Walnuts: A very heavy crop, but *Bacteriosis* is thinning it out considerably. Welcome light rains, with occasional heavy thunder-storms, have relieved the situation considerably, although it has come almost too late to be of much benefit to the current crop.—*W. R. L. Williams.*

Manawatu and Wairarapa.—Apples: Mid-season varieties very good, although there has been a considerable amount of russeting; splendid crops of Adams's Pearmain all through Manawatu district. This variety is very clean, showing much less scab than other varieties. Where spraying was neglected in December growers are having trouble with the second brood of codlin-moth. There has been a considerable amount of splitting and cracking in Jonathans and Cox's Orange, caused by unfavourable weather in early part of season. Pears: Exception-

ally good season for pears all through district; much less black-spot than in former years; Williams's Bon Chretien, Souvenir de Congress, and Beurre Diel are carrying heavy crops of well-formed fruit. Nectarines and peaches: Nectarines turned out very good; almost all picked. Later varieties of peaches are doing well; Royal George, Kalamazoo, Muir, and Elberta were specially good this season. Plums: Few English varieties still to be picked, but majority gone; Pond's seedling very good, and fetched high prices. Tomatoes: Still fetching high prices in market; on the whole, very good crop, although many growers lost the first truss through unseasonable weather.—*G. Stratford.*

WANGANUI.—Apples: Weather good; crop maturing satisfactorily; many young trees overloaded; by thinning the fruit and supporting the branches the crop would be sounder, brighter, and just as heavy, and the trees preserved. Apricots: Trees doing well; overvigorous trees should be summer-pruned. Cherries and gooseberries: Doing well generally; some growers could improve their prospects considerably by attending to their plants after harvesting the crop; early defoliation, through want of spraying, is too common. Lemons: Some good crops maturing on the west coast. Nectarines and peaches: Getting towards the end of a very fair season. Pears: Some good crops maturing well; too much time wasted trying to keep "clean" trees quite unsuitable for the locality; they should be replaced by proved varieties. Plums (English): Crops good on the stiffer land. Plums (Japanese): Foliage wants more attention after harvesting the crop. Strawberries: Plants making fair growth where receiving attention. Tomatoes: Fair crops; considerable blight where spraying has not been systematic. —*W. C. Hyde.*

HASTINGS.—The plum and peach crops are almost over; supplies rather short. Ripe-rot and rust fungi are rather troublesome. Crops of apples and pears are heavy. Fruit, generally, is in first-class condition. Owing to drought and other climatic conditions the tomato crop is not satisfactory.—*J. A. Campbell.*

WELLINGTON.—Apples: Fair; colouring well; early varieties bring fair prices. Apricots: Poor crop. Nectarines: Poor crop. Peaches: Poor crop. Pears: Average crop, and selling fair. Plums (English): Poor crop. Plums (Japanese): Fair crop harvested; good prices. Raspberries: Poor crop. Tomatoes: Crop below average; prices good; Irish blight prevalent; large orders coming in from Auckland; 10 tons shipped this month.—*T. C. Webb, jun.*

NELSON.—Apples: Growers are very busy now picking for export and local trade; Cox's Orange has been very disappointing, most of the fruit being very rough and cracked; Munroe's Favourite is yielding very heavy crops, but there is also a lot of rough fruit in many orchards; a start is also being made on Jonathan—the fruit is well forward, but not too well coloured yet. Pears: Heavy crops are being gathered throughout the district, and on the whole are very clean, considering the very unfavourable weather in the early part of the season. Apricots, nectarines, and Japanese plums are now finished. Plums (English): Still a few to be picked of Grand Duke, Golden Drop, and Coe's late red varieties. Strawberries: Only a moderate second crop was picked; many places suffered from the continued dry weather. Tomatoes: After the dry weather set in many of the tomato plots recovered, and have turned out very fair crops; but very heavy losses were sustained by some. Peaches: Elberta, Muir, Kalamazoo, Gold-dust, Kia Ora, and other mid-season varieties are nearly finished; some very good crops of these have been harvested. There are good crops of Salway still to come, with lesser quantities of Remuera Beauty, and late Cling varieties —*J. H. Thorp.*

BLENHEIM.—Apples: Heavy crop; on the average not so much codlin-moth as last year. Apricots: Heavy crops; fruit harvested; a great deal of fruit was cracked through so much wet weather. Cherries and gooseberries: All fruit harvested. Lemons: Still gathering a few. Nectarines: Medium crop; fruit nearly all harvested; a few late sorts being gathered now. Peaches: Medium crop; would have been heavy crop only for damage done by brown beetle, which is becoming a serious pest for stone-fruit in this district. Pears: Heavy crop; pear-scab not looking so bad as last month. Plums (English and Japanese): Medium crop. Tomatoes: Good crops; fruit under glass nearly all gathered; commencing to gather a few outside. Walnuts: Medium crop; borer attacking trees and killing the tips of the limbs, and in some instances killing limbs right out.—*B. G. Goodwin.*

NORTH CANTERBURY AND WEST COAST.—Apples: Fair crop; harvesting now in full swing. Apricots: Crop harvested. Cherries: Crop harvested. Gooseberries: Crop finished. Nectarines: Fair to good crop; nearly over. Peaches: Good crop. Pears: Light crop. Plums (English): Fair crop. Plums (Japanese): Light crop; nearly over. Raspberries and strawberries: Crop now finished. Tomatoes: Indoor nearly finished; outdoor coming in very slowly. Walnuts: Light crop.—*W. J. Courtier.*

CHRISTCHURCH AND SUBURBS.—Apples: Short crop; red mite and codlin-moth very bad in the district. Pears: Good crop mid-season; late varieties short crop. Plums (English): Turning out very well. Tomatoes: Outdoor tomatoes ripening very slowly, crop now promising much better returns; indoor growers have had a good month, and the crop is holding on better than was anticipated.—*Gordon Esam.*

TIMARU.—Apples: Powdery mildew and *Bryobia* mite much in evidence; black-spot also present. Peaches: Crop, with the exception of late varieties, harvested. Pears: Some varieties badly scabbed. Plums (English): Plum-rust (*Puccinia pruni*) very bad; advocating winter spraying with Bordeaux for control. Plums (Japanese): Crop harvested. Tomatoes: Very poor crop; blight bad in glasshouses; adverse climatic conditions militating against crop ripening in the open. Walnuts: *Bacteriosis* noticeable in isolated cases; weather has been most favourable for fungoid growth.—*A. B. Mansfield.*

DUNEDIN.—Apples: Picking early varieties; summer pruning being carried out in rare instances. Apricots: Crop mostly over. Nectarines and peaches: Good specimens being marketed. Pears: Good crops being harvested. Plums (English and Japanese): Heavy crops. Raspberries and strawberries: Crop now over. Tomatoes: Good crops.—*W. T. Goodwin.*

HONEY-CROP PROSPECTS.

THE Director of Orchards, Gardens, and Apiaries Division has received the following reports on the apiary prospects from the Apiary Instructors:—

AUCKLAND.—The honey crops in the Auckland districts will, on the average, be rather poor; only half-crops is the general report. In a few isolated instances fair crops have been obtained, but the season is now practically over. Prices are likely to be good, and there is a good local demand for good-grade honey. Beeswax is in demand, 1s. 4d. per lb. being offered.—*G. V. Westbrooke.*

WELLINGTON.—The honey crop in my district this season has not been so successful as anticipated; consequently prices should have a tendency towards increasing. The general quality of the crop is about as usual. Beeswax should realize 1s. 6d. per lb. when refined.—*F. A. Jacobsen.*

CHRISTCHURCH.—Beekeepers have been busy extracting lately, and the new season's honey is coming on to the market. The honey crop will be well up to the average season, but not so large as last year. The fact of there being less honey owing to the season and the export trade getting established has had a very beneficial result; prices are in advance of last season by ¾d. to 1d. per lb. for honey in bulk. One beekeeper sold the whole of his crop at 4d. per lb. and the buyer provides tins, &c. This he attributes entirely to the export trade relieving the market of surplus. Just over 4 tons were graded and exported in February. Information recently to hand states the market at Home is quiet. A consignment of Canterbury honey sold for 44s. 6d., and another lot for 45s.—*L. Bowman.*

DUNEDIN.—The main flow of nectar is over, but a fine spell of good weather has enabled the bees to work the catsear and hawkweed. Beekeepers have finished extracting; this work has been somewhat delayed owing to the spells of bad weather. Very little honey has been sent forward to market, beekeepers not being in a hurry to quit lots, as prices will undoubtedly rise as the season advances. A small consignment of sections brought 6s. 6d. per doz., and bulk honey is quoted at 3¾d. to 5½d. per lb., according to quality and packing.—*E. A. Earp.*

MARKET CONDITION OF LOCAL FRUIT AND VEGETABLES.

THE Fruit Inspectors of the Orchards, Gardens, and Apiaries Division report as follows on the condition of locally grown fruit and vegetables in the shops and auction-rooms, and the market position of these, for the month of February :—

AUCKLAND.—The local markets have been considerably oversupplied during the past month, and the returns even for first-class fruit have been unsatisfactory. The volume coming to hand is now showing a marked decline, and, although prices are still low, an advance on last month's figures may reasonably be anticipated. Choice late peaches are realizing fair prices, and English plums are rallying owing to diminishing supplies. Tomatoes are in good demand, as Auckland supplies are shorter than usual this season. The approximate prices for the month are as follow: Apples: Superior, good colour, 5s. to 6s.; good, 3s. to 4s.; cooking, 2s. 6d. to 3s. 6d. Pears: Bon Chretien—best, 6s. to 7s. 6d.; good, 5s. to 6s.; others—dessert, 3s.; cooking, 3s. to 3s. 6d. Plums: English, 2s. 6d. to 3s. Peaches: Best, 3s. 6d. to 4s.; good, 2s., 2s. 6d., 3s.; others, 1s. 3d. to 1s. 6d. Tomatoes: Hothouse, 5s. to 6s.; outdoor, 2s. to 3s. Lemons: Prime, 10s.; seconds, 4s. to 6s. Cape gooseberries, 3d. to 4d. per lb. Quinces, 2s. to 2s. 6d. Passion-fruit, 2s. 6d. to 4s.—*C. Craigie.*

WELLINGTON.—The markets are very busy at present, and very good prices have been realized. Apples are fair; during the early part of the month several lines had to be destroyed, being baldy infested with codlin-moth and scale. Lately the consignments are arriving fairly free from disease. Pears are gradually advancing in price. Peaches are also realizing satisfactory prices. Tomatoes were worth 12s. 1d. per case—a record. The supply is increasing, and prices are rapidly falling; tomatoes may now be bought at 1s. 3d. per case. The decrease has caused some growers to send their fruit to other districts where better prices are quoted. Apples: Cooking, 3s. 6d. to 5s. 6d.; dessert, 6s. 6d. to 8s. 6d. Pears: Williams are worth 10s. per case, Louise Bonne Jersey 9s., Fertility 5s. to 6s. 6d. Peaches, 3s. 6d. to 7s. Plums: Grand Duke, 5s. 6d.; Pond's Seedling, 3s. 6d. Tomatoes, 1s. 3d. per case. Vegetables are in good demand and satisfactory prices are ruling. Onions are at £7 10s. to £8 10s. per ton. Potatoes, good quality, £5 10s. per ton.—*T. C. Webb, jun.*

CHRISTCHURCH.—Shipments of stone-fruits and tomatoes from Nelson are falling off. Teviot supplies are also shortening. The supply of local outdoor tomatoes is very short, but should greatly increase as the month advances. Following are the average prices for the month: Loganberries (an odd line), demand poor, 4d. to 5d. Strawberries, a few forward, 9d. to 1s. Indoor tomatoes, 5d. to 7d.; outdoor—local, 3d. to 5d. (present quotation); Nelson tomatoes, 3d. to 4d. Local grapes, in competition with imported, 5d. to 7d. Plums, 1½d. to 2d. Peaches, 1¾d. to 2½d. Nectarines, 2½d. to 3d. Apricots, 2½d. to 5½d. Apples: Dessert rather scarce, 2d. to 2½d. per lb.; cookers, 1d. to 1½d. Pears: Dessert, 4s. to 5s.; cookers, 3s. to 4s. Cucumbers, 1d. to 1½d. per lb. Potatoes, £2 15s. to £3 in paddock (present quotation). Onions, £4 per ton in paddock—*Gordon Esam.*

DUNEDIN.—Heavy consignments of fruit have come forward this month, plums, apples, and pears being in oversupply. Peaches have been fairly plentiful, but apricots, nectarines, and tomatoes have been scarce. Vegetables have been scarce. More care should be taken with the packing of pears and apples, especially the former, which have arrived from Hawke's Bay in bad condition through faulty packing. Prices for the month ruled as follow: Apples: Cookers, 3s. to 5s. 6d. per case; eaters, 6s. to 7s. 6d. per case. Pears, 5s. to 7s. per case. Tomatoes, 5d. to 8d. per lb. Grapes, 9d. to 10d. per lb. Peaches, 2½d. to 3½d. per lb.

Apricots, 3d. to 4d. per lb. Nectarines, 1¾d. to 2½d. per lb.; extra choice up to 4d. per lb. Plums, 1½d. to 2½d. per lb. Green peas, 1¾d. to 2¼d. per lb. Beans, 2d. to 3d. per lb. Cabbages, 2s. to 4s. per sack. Cauliflowers, 7s. to 9s. per sack. Rhubarb, 2s. to 4s. per cwt. Marrows, 3s. to 4s. per sack.—*E. T. Taylor.*

Bluff.—The market has been well supplied this month with New-Zealand-grown fruits. Auckland fruit has been good, except one line of pears infected slightly with codlin-moth. A good deal of Nelson fruit arrived in an overripe condition, many cases of plums and peaches being quite useless. Fruit from Canterbury is mostly always thoroughly clean and in good order. An exception this month was one line of pears infected with codlin-moth and scab. Otago Central fruit has been the main supply on this market. The supply is plentiful, and the fruit is mostly in first-rate order and clean. Several lines of plums from Roxburgh were touched with mussel scale. Apricots and greengages were always in demand, but plums and peaches were a glut on the market towards the end of the month, peaches being hard to sell at 1d. per lb. Tomatoes throughout were very scarce, realizing 9d. to 1s. 3d. in the shops. The current prices for the month were as follow: Apples, 1½d. to 2d. per lb. Pears, 2d. to 2½d. per lb. Tomatoes, 7d. to 1s. per lb. Apricots, 2d. to 3½d. per lb. Peaches, 1d. to 3½d. per lb. Nectarines, 1½d. to 3d. per lb. Plums, 1d. to 3d. per lb. Greengages, 2½d. to 3½d. per lb. Grapes, 1s. to 1s. 4d. per lb. Cucumbers, 2s. to 3s. per dozen. Potatoes, 4s. to 5s. per cwt.; potatoes on trucks at country sidings, £3 10s. per ton. Rhubarb, 1½d. per lb. Peas and beans, 1½d. per lb. Cabbages, 1s. 6d. to 2s. per dozen. Cauliflowers, 2s. to 2s. 6d. per doz. Carrots and parsnips, 1d. per bunch.—*R. Hutton.*

To the formerly known lactic-acid beverages, réfir and kumiss, another has lately been added—viz., yoghurt. The use of this in Germany has spread very much, as it is credited with preventing infection of the intestines, and being consequently conducive to health. Yoghurt, as is well known, is the national beverage of the Bulgarians. As a proof that the daily regular use of yoghurt is especially wholesome it is stated that in Bulgaria, with its 4·3 million inhabitants, there are more nonagenarians than in the whole of the German Empire.—*Dr. Hittcher, in a Bulletin of the International Institute of Agriculture.*

In order to place the grain trade of Russia on a proper basis—that country now produces on an average 70,000,000 tons of cereals per annum, and is the principal purveyor of wheat, rye, barley, and oats to the European markets—the Russian Imperial Bank has taken upon itself the construction of elevators for cleaning and storing grain. It is proposed to construct sixty-six elevators at railway-stations and eighteen at river ports, of an aggregate capacity of 700,000 tons. When the present series of elevators are completed the Imperial Bank will construct elevators in the southern provinces and in western Siberia. Eighty-four elevators will be completed by 1916, with a capacity of nearly 1,000,000 tons. At these elevators the Russian Imperial Bank will arrange to accept parcels of grain from 25 pouds and upwards for storing and cleaning. (Poud = 36 lb.) A certificate will be given for each parcel, and under these certificates advances of money will be issued up to 80 per cent. of the actual value of the goods. The elevators will also accept grain to be sold on commission.—*H.M. Consul-General at St. Petersburg, in the "Board of Trade Journal."*

ARGENTINE TRADE WITH BRITAIN.

The Department has received the following cablegram from Buenos Aires, dated 4th instant:—

The following shipments of produce were shipped from the Argentine to the United Kingdom during February, 1914 (compared with February, 1913):—

	1914.	1913.
Frozen beef (quarters)	119,000	252,000
Chilled beef (quarters)	353,000	237,000
Frozen mutton (carcases)	147,000	283,000
Frozen lamb (carcases)	30,000	56,000
Butter (cwt.)	10,370	13,314

The reduction of the tariff in the United States on butter from 6 cents to $2\frac{1}{2}$ cents per pound will, no doubt, open the Californian and West Coast markets to New Zealand and Australia, and the East Coast markets to Siberian and (in winter) Danish butter.—*Hansen's Dairy Bulletin.*

Local beef in San Francisco usually comes from animals under three years old. It is therefore more tender and in smaller joints than the Australian. The Australian meat is from four-year animals, and is therefore more mature, and does not cut up into the comparatively small joints which are chiefly in demand in San Francisco. Possibly Australian exporters could meet this difficulty by slaughtering younger animals. At present the trade with San Francisco hardly warrants this, but something of the kind will have to be done if the local trade is to be satisfactorily catered for. The best customers at present are the ocean steamers frequenting the port, and the caterers of mining and lumber camps where large bodies of men are boarded by their employers. The railway freight between New York and San Francisco is 2·45 cents per pound, so that at present it does not pay to land Argentine meat at New York and send it to San Francisco by rail; but conditions will be different when the River Plate meat can be sent direct through the canal. The San Francisco prices for steer beef are—First quality $12\frac{1}{4}$ to $12\frac{3}{4}$ cents per pound, and second quality 12 to $12\frac{1}{4}$ cents per pound. Australian frozen beef can be landed at about $7\frac{1}{2}$ cents per pound. The local wholesale price for first-quality mutton in San Francisco at the present time is $9\frac{1}{2}$ to 10 cents per pound; second quality, from $8\frac{1}{2}$ to 9 cents per pound. This latter is what the imported article would compete with. Australian mutton can be landed at San Francisco at $7\frac{1}{2}$ to $8\frac{1}{2}$ cents per pound, so there is very little margin of profit, and none to cover the expense that often has to be incurred for storage—$\frac{1}{4}$ cent per pound per month.—*H.M. Consul-General at San Francisco, in the "Board of Trade Journal."*

THE DOMINION'S EXPORTS TO BRITAIN.

COMPILED FROM MANIFESTS OF VESSELS SAILED DURING RESPECTIVE MONTHS OF CURRENT AND PRECEDING SEASONS.

Month.		Mutton, Carcases.	Lamb, Carcases.	Beef, Quarters.	Pork, Carcases.	Butter, Boxes.	Cheese, Crates.	Wool, Bales.	Wheat, Sacks.	Oats, Sacks.	Rabbits, Crates.	Hemp, Bales.	Tow, Bales	Kauri-gum, Cases.
January,	1914	231,766	464,185	30,424	33	150,492	136,086	108,742	..	500	2,851	15,234	4,306	11,133
,,	*1913*	*166,714*	*229,179*	*6,886*	*611*	*109,251*	*63,864*	*118,986*	..	*329*	..	*6,969*	*2,215*	*4,110*
February,	1914	354,190	334,207	14,100	3	86,570	59,532	127,372	..	4	..	3,709	633	7,607
,,	*1913*	*326,337*	*403,698*	*12,666*	*64*	*89,098*	*81,733*	*127,968*	..	..	..	*12,520*	*4,295*	*7,973*
March,	1913	86,224	210,166	7,428	250	47,560	59,844	49,661	..	115	..	12,552	7,662	4,043
,,	*1912*	*324,192*	*518,402*	*20,201*	*16*	*64,925*	*49,308*	*70,022*	..	*4,980*	..	*3,832*	*1,352*	*2,644*
April,	1913	303,937	647,948	16,834	457	11,358	52,934	61,988	..	300	..	9,049	3,351	3,889
,,	*1912*	*213,178*	*355,829*	*7,046*	..	*38,986*	*38,137*	*31,615*	*4,905*	*2,180*	..	*5,134*	*1,958*	*4,458*
May,	1913	418,221	731,520	22,073	100	637	46,304	33,281	..	265	2,000	15,751	5,005	9,057
,,	*1912*	*454,506*	*744,287*	*32,691*	..	*1,441*	*40,535*	*51,833*	*11,157*	*26,569*	*1,500*	*11,963*	*2,826*	*6,287*
June,	1913	315,034	528,815	24,444	588	79	3,166	18,741	..	..	13,072	13,592	4,065	5,439
,,	*1912*	*170,738*	*287,697*	*24,605*	*221*	*558*	*7,712*	*18,138*	*9,160*	*7,622*	*2,039*	*5,646*	*1,168*	*1,213*
July,	1913	215,713	331,353	14,030	..	..	1,687	17,169	5,651	300	9,190	9,682	1,720	10,793
,,	*1912*	*291,097*	*371,474*	*29,457*	*210*	*684*	*1,255*	*16,567*	*44,324*	*23,216*	*20,573*	*7,463*	*1,856*	*5,892*
August,	1913	161,593	178,263	13,129	6	8	407	8,494	11,604	45	38,480	3,714	2,310	6,406
,,	*1912*	*207,239*	*157,589*	*10,478*	..	*559*	..	*10,409*	*42,580*	*38,802*	*19,562*	*3,758*	*523*	*4,219*
September,	1913	133,122	83,521	5,334	16	6,575	2,020	7,176	..	..	16,336	3,826	1,501	10,049
,,	*1912*	*44,657*	*40,759*	*1,174*	..	*8,723*	*1,204*	*6,671*	*15,742*	*17,363*	*19,933*	*2,957*	*501*	*3,671*
October,	1913	14,122	25,735	580	..	42,847	21,452	2,705	..	..	10,020	6,986	3,672	2,923
,,	*1912*	*51,263*	*15,393*	*3,882*	..	*49,962*	*16,389*	*4,647*	*7,952*	*64,480*	*5,396*	*4,193*	*401*	*9,075*
November,	1913	20	1,479	..	..	53,468	23,722	1,891	..	..	2,478	4,162	771	2,314
,,	*1912*	*54,175*	*8,286*	*282*	..	*140,751*	*57,181*	*33,305*	*3,680*	*40,896*	*13,892*	*9,866*	*1,911*	*5,466*
December,	1913	128,087	86,890	8,909	..	249,526	124,821	51,385	..	250	24,479	19,807	5,276	11,273
,,	*1912*	*117,740*	*106,310*	*4,774*	..	*119,885*	*66,213*	*44,789*	*5,868*	*30,490*	*10,070*	*3,816*	*2,613*	*3,686*

LONDON MARKET VALUES.

Comparative Statement compiled from the High Commissioner's Cables for the Three Months ended 28th February, 1914.

London Date.	Wool. Bradford Quotations for Tops. 36's.	40's.	44's.	50's.	56's.	60's.	Mutton. Canterbury.	Mutton. North Island.	Lamb. Canterbury.	Lamb. Other than Canterbury.	Beef. Hinds.	Beef. Fores.	Butter. New Zealand.	Butter. Danish.	Cheese. New Zealand White.	Cheese. New Zealand Coloured.	Cheese. Canadian.	Hemp (Spot). New Zealand Good-fair.	Hemp (Spot). New Zealand Fair.	Hemp (Spot). Manila.	Hemp (Forward Shipment). New Zealand Good-fair.	Hemp (Forward Shipment). New Zealand Fair.	Hemp (Forward Shipment). Manila.	Wheat. Short-berried.	Wheat. Long-berried.	Oats. Sparrowbills.	Oats. Danish.
							d.	d.	d.	d.	d.	d.															
1913. Dec. 6	..	..	..	..	..	..	..	5	5 7/8	5 1/2	4 1/2	4	130/0	132/0	66/0	67/0	68/0	27/0/0	24/0/0	29/0/0	26/15/0	24/15/0	28/5/0	..	..	..	..
,, 13	1/2 3/4	1/3	1/3 1/2	1/6 3/4	1/9 1/2	2/2 3/4	..	..	6 1/4	..	..	..	130/0	133/0	66/0	67/0	68/0	27/0/0	24/0/0	29/0/0	26/10/0	24/10/0	27/15/0	..	..	..	..
,, 20	1/2 1/2	1/3 1/4	..	1/6 3/4	1/9 1/4	2/2 1/4	..	5	6 1/2	..	..	..	128/0	133/0	66/0	67/0	68/0	26/0/0	23/15/0	27/0/0	..	..	26/0/0	..	..	..	..
,, 27	..	..	..	..	..	..	..	..	6 3/8	..	4 1/2	4	124/0	133/0	66/0	67/0	68/0	26/0/0	23/10/0	27/0/0	..	..	26/0/0	..	..	..	..
1914. Jan. 3	..	..	..	..	..	..	..	5	6 3/8	..	4	4	122/0	133/0	66/0	67/0	69/0	25/10/0	23/10/0	27/0/0	..	..	27/0/0	..	..	..	..
,, 10	..	..	..	..	..	..	..	5	6 1/2	6 3/4	4 3/8	3 7/8	120/0	130/0	66/0	67/0	69/0	25/10/0	23/5/0	27/10/0	25/15/0	23/15/0	27/0/0	..	..	..	..
,, 17	..	..	..	..	..	..	..	5 1/8	6 1/2	6 3/4	4 1/2	4	118/0	128/0	66/0	67/0	70/0	26/0/0	24/0/0	28/10/0	26/5/0	24/5/0	28/0/0	..	..	..	..
,, 24	..	..	..	..	..	..	..	5 1/8	6 1/4	7 1/4	..	..	116/0	127/0	66/0	67/0	70/0	..	..	28/10/0	26/10/0	24/5/0	29/0/0	..	..	..	..
,, 31	..	..	..	..	..	..	..	4 7/8	..	6 7/8	4 3/4	4	116/0	128/0	65/0	67/0	70/0	..	25/0/0	28/10/0	26/10/0	24/5/0	29/0/0	..	..	..	..
Feb. 7	1/3 1/4	1/3 1/2	1/4 1/4	1/7 1/2	1/9 3/4	2/3 1/4	..	4 3/4	..	6 5/8	4 1/2	4	116/0	126/0	64/0	66/0	72/0	25/10/0	23/0/0	28/5/0	26/0/0	23/15/0	28/10/0	..	..	..	..
,, 14	..	..	..	..	..	..	..	4 5/8	..	6 1/2	4 1/2	4	116/0	123/0	64/0	66/0	72/0	25/10/0	23/5/0	28/0/0	25/15/0	23/10/0	28/5/0	..	..	..	..
,, 21	1/3 3/4	1/4	1/4 3/4	1/8	1/10 3/4	2/4	..	4 7/8	..	6 1/2	4 1/2	4	116/0	124/0	64/6	66/6	72/0	25/5/0	23/0/0	27/5/0	25/15/0	23/5/0	27/10/0	..	..	..	..
,, 28	..	..	..	..	..	..	..	4 3/4	..	6 3/8	4 1/2	4	118/0	126/0	64/6	67/0	72/0	25/5/0	23/0/0	27/0/0	25/10/0	23/5/0	26/10/0	..	..	..	..

HEMP AND TOW GRADING RETURNS.

FEBRUARY.

Hemp.—The total number of bales graded was 13,709, as compared with 16,082 for the corresponding month of last year, a decrease of 2,373 bales. For the twelve months ending 28th February, 1914, the number of bales graded was 166,216, as compared with 111,786 for the previous twelve months, the increase being 54,430 bales.

Tow.—During the month 4,126 bales were dealt with, as compared with 5,710 for the corresponding month of last year, a decrease of 1,584 bales. For the twelve months ending 28th February, 1914, the number of bales graded was 55,454, as compared with 37,250 for the previous twelve months, an increase of 18,204 bales.

HEMP, TOW, AND STRIPPER-SLIPS GRADED THROUGHOUT THE DOMINION DURING THE MONTH OF FEBRUARY, 1914.

Hemp.

Port.	Superior.	Fine.	Good-fair.	Fair.		Common.	Rejected.	Condemned.	Total.
				High Point.	Low Point.				
	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.
Auckland ..	..	..	281	606	1,012	279	21	40	2,239
Napier ..	..	..	90	49	..	..	..	..	139
Foxton ..	..	..	1,062	2,271	316	116	11	..	3,776
Wellington ..	..	48	1,311	2,003	1,277	539	20	..	5,198
Blenheim ..	..	..	166	..	..	..	..	..	166
Picton ..	..	27	112	101	4	..	..	..	244
Lyttelton ..	..	..	..	..	..	..	..	..	..
Dunedin ..	..	..	248	147	18	4	..	..	417
Bluff	..	..	722	609	175	24	..	..	1,530
Totals ..	..	75	3,992	5,786	2,802	962	52	40	13,709
Percentages of totals	..	0·55	29·12	42·20	20·44	7·02	0·38	0·29	..

Tow.

Port.	First Grade.	Second Grade.	Third Grade.	Condemned.	Total.
	Bales.	Bales.	Bales.	Bales.	Bales.
Auckland ..	..	137	530	169	836
Napier	30	19	4	..	53
Foxton ..	125	470	204	15	814
Wellington ..	233	526	590	8	1,357
Blenheim ..	..	108	21	..	129
Picton	56	94	..	..	150
Lyttelton ..	..	..	..	..	..
Dunedin ..	..	49	78	..	127
Bluff	18	298	319	25	660
Totals ..	462	1,701	1,746	217	4,126

Stripper-slips.—Passed for export: Foxton, 121; Wellington, 67—total, 188.

NEW ZEALAND-SAN FRANCISCO TRADE.

FOLLOWING are the shipments of produce for San Francisco, Tahiti, and Rarotonga, and transhipments for Vancouver from New Zealand, since October last:—

—	"Tahiti," 10th Oct.	"Moana," 13th Nov.	"Aorangi," 5th Dec.	"Tahiti," 7th Jan.	"Moana," 30th Jan.
Gum, packages	21	..	57	6	44
Seeds, sacks	365	..	..	184	..
Grain, &c., sacks	76	34	83	148	250
Meat, cases	950	240	616	896	431
Onions, cases	..	..	2	5	6
Potatoes, sacks	9	2	6	42	20
Sundries, packages ..	247	16	1,825	1,891	469
Butter, boxes	4,415	4,198	5,815	10,819	2,702
Hemp, bales	..	131	..	..	100
Frozen lamb, carcases ..	2	2	4	502	2
,, mutton, ,, ..	..	..	..	..	..
,, veal, ,, ..	..	..	..	..	..
,, beef, quarters ..	..	..	..	..	..
,, sundries, packages ..	..	..	..	..	..
Timber, pieces	136	..	..	..	..

NEW ZEALAND-VANCOUVER TRADE.

FOLLOWING are the shipments of produce for Vancouver and North American ports from New Zealand since September last:—

—	"Makura," 27th Sept.	"Niagara," 25th Oct.	"Marama," 22nd Nov.	"Makura," 24th Dec.	"Niagara," 17th Jan.	"Marama," 14th Feb.
Butter, boxes ..	10,062	18,335	17,009	23,698	20,076	17,406
Mutton, carcases	1,119	1,189	1,450	..	1,090	100
Lamb	..	..	..	10	1,000	..
Beef, quarters ..	955	259	..	990	1,933	652
Veal, carcases ..	171	291	285	362	877	402
Frozen sundries, packages	2,202	12	55	12	..	33
Wool, bales ..	207	320	28	6	17	2
Grass-seeds, beans, &c., sacks	9	..	2	8	42	..
Hides and skins, sacks, &c.	3,533	4,144	2,947	709	2,083	2,551
Onions, cases ..	..	..	..	..	4,750	2,500
Sheep-skins, bales	..	146	..	..	130	161
Jam, cases ..	..	74	101	40	135	89
Sundries, packages	2,586	1,018	2,183	172	1,518	219
Potatoes, crates ..	..	..	..	..	..	38
Kauri-gum, packages	180	267	300	330	303	300
Hemp, bales ..	284	380	129	13	..	..
Rabbits, crates ..	..	100	..	..	..	300
Timber, pieces ..	2,819	2,709	468	..	3,450	66
Eggs, cases ..	..	336	..	20	..	1
Meats (canned, &c.), cases	..	60	52	7	1,605	30
Fertilizers, sacks..	..	914	..	..	..	..

STOCK EXPORTED.

THE following table shows the numbers and descriptions of stock exported from the Dominion during the month of February:—

Port of Shipment.	Horses.			Sheep.			Cattle.			Pigs.		Dogs.		
	To Great Britain.	To Australia.	To Pacific Islands.	To Australia.	To Pacific Islands.	To South America.	To Australia.	To Pacific Islands.	To Montevideo.	To Australia.	To Pacific Islands.	To Australia.	To Pacific Islands.	To London.
Auckland ..	..	5	15	..	177	..	..	5	..	..	19	7	2	..
Napier ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Wellington	4	7	..	51	..	..	..	..	..	..	..	4	..	..
Lyttelton ..	..	11	..	79	..	..	..	..	..	..	..	..	..	..
Dunedin ..	..	24	..	..	..	..	..	..	..	..	..	3	..	..
Bluff ..	..	4	..	..	..	..	..	..	..	..	..	1	..	..
Totals ..	4	51	15	130	177	..	..	5	..	..	19	15	2	..

Auckland also exported 9 crates of fowls (144) to the Pacific islands.

Following are the particulars of horses exported: Draught—21 stallions, 14 mares; trotting—1 stallion, 1 mare, 5 geldings; thoroughbred—5 geldings, 3 mares; 1 pony gelding, 19 geldings.

STOCK IN QUARANTINE.

THE following stock were received into quarantine during the month of February:—

No.	Description.	Sex.	Port of Origin.	Owner or Agent.	Address.
	SOMES ISLAND (WELLINGTON).				
1	Collie dog ..	Male ..	Liverpool	C. S. Hay ..	Paparangi-kai, Wanganui.
1	Wire-hair terrier..	,, ..	London ..	Hugh Latter ..	Wellington.
1	Irish setter ..	Female	,, ..	F. Daines ..	Blenheim.
1	Pomeranian ..	Male ..	,, ..	Mrs. P. Lamont..	Hawke's Bay.
2	Shorthorn heifers	..	Sydney ..	J. C. Wright ..	Matapu, Taranaki.
	QUAIL ISLAND (LYTTELTON).				
1	Bulldog ..	Male ..	London ..	F. Hickinbottom	Christchurch.
1	,, ..	Female	,, ..	,,	,,
1	Collie dog ..	Male ..	,, ..	H. I. Little ..	Woodgrove.